Underdiagnosis, Undertreatment, and Noncompliance With Treatment in People Who Died by Suicide

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Abstract

Background: This study explored the characteristics of people who die by suicide, comparing those who had depression with those who did not.

Methods: Clinical data were collected through a postmortem proxy-based semistructured interview (psychological autopsy). Postmortem toxicological analysis provides data on the presence of substances or drugs in the blood of suicides. Participants were adults who died by suicide in the province of Seville, Spain, during 2006–2016. The main independent variables were previous diagnosis, postmortem diagnosis, prescribed treatment, and treatment found in blood. The primary outcome was the postmortem diagnosis of depression, after which the sample was divided into 2 groups according to *DSM-IV* criteria to the presence or absence of major depressive episode (MDE).

Results: Our sample is composed of 313 people, of which 200 (63.9%) had a diagnosis of MDE according to the psychological autopsy. Predeath diagnosis of depression was more frequent in MDE suicides than in non-MDE suicides (18.6% vs 3.5%, respectively; $X^2 = 23.420$; $df = 9$; $P = .005$) and had more access to mental health treatment previous to death (67.7% vs 35.6%, respectively; $X^2 = 27.572$; $df = 1$; $P < .001$). Antidepressants were prescribed in 21.5% of the MDE suicides, but only 8.5% of them were taking them at the time of death according to the toxicology exam.

Conclusions: The underdiagnosis of depression in people who die by suicide is striking, as is the undertreatment. Further efforts must be made to train primary care physicians in the proper identification of persons at risk of suicide, as they are one of the main gatekeepers in the fight for suicide prevention.

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Affective disorders, in particular unipolar and bipolar depression, are the medical conditions with highest risk of death by suicide.[1–3] However, retrospective studies using psychological autopsy or medical records browsing show that most suicides are not diagnosed with depression despite receiving healthcare attention in the weeks before their death.[2,4–6] Likewise, treatment with antidepressants is seldom offered[4,7–9] even though around 70% of people who die by suicide had contacted healthcare services in the previous month.[7,8,10,11]

Suicide risk factors, both individual and environmental, are highly heterogeneous. In addition, interactions between different risk factors, such as age, gender, social and environmental circumstances, and mental disorders, may lead to a higher risk in some individuals than in others, so new models have been proposed to explain the suicide risk of specific subpopulations.[12] According to the stress-diathesis model, there are some preexisting factors in people (personality traits, social factors, negative life events, etc) that make them more vulnerable to certain stressful events, ultimately leading to the development of suicidality.[13–15] For some authors, stress, both acute and chronic, at different stages of life is what makes the individual vulnerable to a suicidal response to negative events, following biological changes.[16] For other authors, the role of the individual in their environment facilitates suicidal behavior, and not the presence of a mental illness. Thus, people who feel they are a burden to others (perceived burdensomeness) and do not feel integrated (thwarted belongingness) are very vulnerable to negative events and may engage in suicidal behavior.[17] Moreover, there is a paucity of models for specific disorders, but one exception is that of Turecki et al for borderline personality disorder (BPD), who observed differences between suicidal BPD and nonsuicidal BPD patients that could be explained by the presence of comorbidities, particularly antisocial personality disorder, and more aggressive suicidal behaviors.[18] These differences may be related to early-life adversity and family traits with high levels of impulsivity-aggressivity, which may lead to developmental problems and emotional dysregulation,

Clinical Points

- Most people with depression who committed suicide had not been diagnosed or treated for depression, despite having visited health services in the previous weeks.
- Death by suicide is difficult to predict at the individual level, but people with a major depressive episode, with melancholic symptoms, hopelessness, and previous attempts, are at higher risk of suicide, and these factors should be taken into account when suicide risk is assessed.

causing a vulnerability to stressful events in the future.[19,20]

Models describing the relationship between inflammation and suicide have also been described, with findings such as increased inflammatory cytokines in the orbitofrontal cortex or activation of the monocyte-macrophage system.[19] Early-life adversities may cause epigenetic changes, resulting in immune alterations, with high levels of inflammation, which make the person vulnerable to mental disorders in adulthood.[20–22]

In contrast, there are no specific explanatory models for depression, the disorder on which we focus this study. In addition, each risk factor has a different weight in suicidal ideation, suicide attempts, and completed suicide.[23] Some of the factors associated with death by suicide in people with depression are substance use just before suicidal behavior, previous suicide attempts, and the presence of serious somatic illness.[3,5,7,24–26] Although the association between antidepressant use and death by suicide is unclear,[27,28] some studies associate antidepressant prescription with lower suicide rates in persons older than 25 years,[29–34] but it is less clear in younger persons. However, the decline in antidepressant use among young people has coincided with an increase in suicide rates.[35]

Antidepressant use in those who die by suicide can be explored through 3 approaches: reviewing the prescription of antidepressants before death,[2,30] reviewing attendance at healthcare resources such as primary care or mental health, or analyzing the substances found in blood at the time of death. A few studies have described suicides, exploring variables such as previous diagnosis, postmortem diagnosis (performed through psychological autopsy), prescribed treatment or treatment found in blood in toxicological analyses.[4,36,37] It is unusual to combine psychological autopsy studies with biological measurements. To our knowledge, there are no studies that study the diverse types of profiles that can coexist among suicide using the psychological autopsy approach.[38] Antidepressants have been found in 10%–20% of toxicological analyses, while the substance most commonly found is alcohol.[4,7,30,33,39] In some studies, benzodiazepines and other anxiolytic substances are the prescription drugs most commonly detected,[30,39] while in others they are detected similarly to antidepressants.[40–42]

Using psychological autopsy and toxicological analysis, this study aims to explore the characteristics of people who die by suicide in terms of previous diagnosis, postmortem diagnosis, prescribed treatment, and treatment found in blood and to compare those who had depression with those who did not.

METHODS

Setting and Design

This study was conducted at the Department of Psychiatry of the University of Seville in collaboration with the Institute of Legal Medicine and Forensic Sciences of Seville (Seville, Spain). This study has been approved by the Ethics Committee of the University of Seville.

Sample

Our sample consisted of people who died by suicide in the province of Seville between 2006 and 2016. A total of 2,258 deceased were transferred to the Institute of Legal Medicine of Seville, located at the entrance to the Faculty of Medicine of the University of Seville, where the medicolegal autopsy was performed and the cause of death was determined. Inclusion criteria were being over 18 years of age at the time of death, having died by suicide, having a medicolegal autopsy performed, and a postmortem toxicological examination including analysis of presence of antidepressants, benzodiazepines, and ethanol. The exclusion criteria were being a minor, other causes of death, doubts about the cause of death, or absence of a medicolegal autopsy. The sample consisted of a subsample of 313 subjects who had undergone both psychological autopsy and a postmortem toxicology study.

Procedure

After confirming the cause of death, a forensic team proposed to the relatives of the deceased to participate in the study, explaining the methodology and objectives. Informed consent to participate in the study was then collected, and a date was agreed upon for the interview to be conducted by means of which the psychological autopsy would be carried out. The interviewees were chosen according to degree of kinship, in order of preference: spouse, first-degree relative living with the patient, first-degree relative not living with the patient, any relative, and friend.

Measures

The interviewers for the psychological autopsy were psychiatrists or psychologists. They were trained to perform the procedure. Multidisciplinary consensus

meetings were held in all cases as recommended by Hawton et al.[43] Interviews were conducted with the relatives or closed ones of the deceased after an average of 11 months after the death. Studies on the validity of psychological autopsy such as that of Conner et al[44,45] have showed a good levels of agreement between subjects and proxy respondents on issues such as the diagnosis of mood and substance abuse disorders, as well as on questions about life events and social support networks.

Diagnosis of major depressive episode (MDE) was established using the Spanish version of Structured Clinical Interview (SCID), which is based on the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition (*DSM-IV*) classification.[46,47] The SCID-I is designed to detect Axis I disorders in research settings. It has showed high sensitivity, specificity, and substantial agreement for EDM when comparing results from interviews with subjects and proxy respondents. Whether or not EDM was diagnosed was taken into account for this study, although it was performed in its entirety.[44] In addition, the diagnoses made by the SCID in psychological autopsy have validity, especially those of Axis I.[48] The κ coefficient obtained for Axis I disorders is greater than 0.79 for most disorders.[49] The κ coefficients of 0.94 were obtained for schizophrenia, 0.63 for major depression, and 0.58 for bipolar disorder.[50] Suicide risk was assessed using the Spanish version of the SAD PERSONS and the NO HOPE scales. The SAD PERSONS assesses clinical and sociodemographic risk factors and contains 10 clinician-rated items that are scored 0 or 1.[51] The NO HOPE assesses hopelessness factors, and contains 6 clinician-rated items that are scored 0 or 1.[52] The SAD PERSONS and NO HOPE scales are not validated in Spain, but their use is recommended in several guides due to their ease of application.[53] To assess depression, the Montgomery-Asberg Depression Rating Scale (MADRS) and the Beck Depression Inventory (BDI) were used. The MADRS consists of 10 items that assess the symptomatologic profile and severity of depression.[54] Scores range from 0 to 60. Scores below 7 indicate no depression; from 7 to 19, minor depression; from 20 to 34, moderate depression; and above 35, severe depression. The MADRS was validated by Lobo et al,[54] and the Cronbach α was over 0.88.[54] The BDI-II (55) assesses the severity of depression. It consists of 21 self-administered items scored from 0 to 4. Mild depression is considered from 18.7 points, moderate with 25.4 points, and severe from 30 points. The BDI-II was validated by Perdigón et al,[55] and the Cronbach α was over 0.87.[55] The Barratt Impulsiveness Scale (BIS-11) was used to assess impulsivity. This scale contains 30 items. Each item is scored according to a 4-degree Likert frequency scale. It has 3 subscales: cognitive, motor, and unplanned impulsivity.[56,57] The BIS-11 was validated by Oquendo et al,[56] and the Cronbach α was over 0.83.[56] The lifetime aggression scale (Brown-Goodwin) was also used. This scale assesses aggression in different settings, is self-administered, and includes 11 items. Each item is scored according to a Likert scale in different life stages (childhood, adolescence, and adulthood).[58] The following information was also collected: medical and psychiatric diagnoses received before death, prescribed medications, and contact with healthcare services.

Statistical Analyses

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 20 for Windows (IBM Corp. Released 2020. IBM SPSS Statistics for Windows, version 27.0. Armonk, NY).

We divided the sample between those who presented a *DSM-IV* diagnosis of MDE and those who did not. Parametric tests for independent samples were used to compare data from both samples. The χ^2 test and Student *t* tests were used to analyze whether the differences between the 2 groups were significant for qualitative or quantitative variables, respectively. We performed a univariate analysis to determine whether the collected variables were associated with having a diagnosis of MDE. The logistic regression analysis was performed using the backward stepwise option. All significant qualitative and quantitative variables were included as possible predictor variables. Variables not completed by most subjects were excluded so that there would be as few missing cases as possible. The Hosmer-Lemeshow test was used to assess the adequacy of the model.

All tests were 2-tailed, with 95% CIs and a level of statistical significance set at a P value < .005.

RESULTS

Characteristics of the Sample

Our sample consisted of 313 people dead by suicide (236 men and 77 women). Of them, 200 (63.9%) had a diagnosis of MDE according to the psychological autopsy (141 men and 58 women). Mean age was 55.93 years (females: 57.81, SD: ±15.44; males: 55.16, SD: ±18.84) in MDE suicides and 48.71 years (females: 48.74, SD: ±20.28; males: 48.70, SD: ±21.04) in non-MDE suicides. Significant differences were found with respect to gender ratio ($X^2 = 5.78$; $P = .016$) and mean age (Student's *t* test $P = .002$) between MDE suicides and non-MDE suicides. Table 1 shows the full characteristics of the sample and the comparison between groups.

Premortem Diagnosis

The MDE group had a greater prevalence of chronic somatic illnesses throughout their lifetime ($X^2 = 4.838$; $df = 1$; $P = .028$) and psychiatric diagnoses ($X^2 = 23.420$; $df = 9$; $P = .005$) than the non-MDE group. Predeath

Table 1.

Clinical Characteristics of People Who Died by Suicide With or Without a Major Depressive Episode

	MDE N = 200 (63.9%)		Non-MDE N = 113 (36.1%)		Differences between groups
	N (%)	Mean (SD)	N (%)	Mean (SD)	
Gender					$X^2 = 5.78$; $P = .016$
Male	141 (70.5)		95 (84.1)		
Female	58 (29.0)		19 (16.8)		
Age, y		55.93 (17.92)		48.71 (20.82)	Student *t* test $P = .005$
Psychiatric diagnosis across the lifespan informed by family					$X^2 = 23.420$; $df = 9$; $P = .005$
Substance abuse/dependence	9 (4.5)		8 (7.1)		
Anxiety	5 (2.5)		2 (1.8)		
Depression	37 (18.6)		4 (3.5)		
Dysthymia	1 (0.5)		1 (0.9)		
Schizophrenia	5 (2.5)		8 (7.1)		
Fibromyalgia	1 (0.5)		0 (0.0)		
Bipolar disorder	4 (2.0)		0 (0.0)		
OCD	0 (0.0)		1 (0.9)		
Personality disorder	1 (0.5)		0 (0.0)		
No diagnosis	136 (68.3)		89 (78.8)		
Previous history of suicidal behavior	N = 200		N = 113		
Previous suicidal ideation or attempt	164 (82.4)		63 (56.8)		$X^2 = 27.165$; $df = 3$; $P < .001$
Previous suicide attempt	105 (52.8)		32 (28.3)		$X^2 = 17.843$; $df = 1$; $P < .001$
Health contact 3 mo before death	N = 195		N = 107		$X^2 = 18.105$; $df = 1$; $P < .001$
Yes	167 (85.7)		69 (64.5)		
No	28 (14.3)		38 (35.5)		
Type of medical service contact 3 mo before death					$X^2 = 19.871$; $df = 5$; $P < .001$
MH	56 (28.0)		14 (12.4)		
Emergency department	7 (3.5)		5 (4.43)		
Primary care	53 (26.5)		28 (24.8)		
MH and others	14 (7.0)		2 (1.8)		
Others	11 (4.5)		10 (6.7)		
No	59 (29.5)		54 (8.9)		
Treatment related to mental illness in the 3 mo prior to death	N = 189		N = 101		$X^2 = 27.572$; $df = 1$; $P < .001$
Yes	128 (67.7)		36 (35.6)		
No	61 (32.3)		65 (64.4)		
Treatment received for the last 3 mo	N = 200		N = 113		
Antidepressants	43 (21.5)		5 (4.4)		$X^2 = 16.214$; $df = 1$; $P < .001$
Benzodiazepines	66 (33.0)		15 (13.3)		$X^2 = 14.647$; $df = 1$; $P < .001$

Abbreviations: MDE = major depressive episode, MH = mental health, OCD = obsessive-compulsive disorder.

diagnosis of depression was more frequent in MDE suicides (18.6%) than in non-MDE suicides (3.5%) ($X^2 = 23.420$; $df = 9$; $P = .005$).

There were no significant differences in the new diagnoses made the 2 years prior to death, both psychiatric and somatic.

Healthcare Contact 3 Months Prior to Death

In the 3 months prior to death, contact with health services was higher in MDE suicides than in non-MDE suicides ($X^2 = 18.105$; $df = 1$; $P < .001$). Both groups visited primary care and emergency department services in a similar proportion (26.5% and 24.8%, respectively). MDE suicides had sought mental health services in a higher proportion (28%) than non-MDE suicides (12.4%), but there were also more people who had no healthcare contact at all in MDE suicides (29.5%) than in non-MDE suicides (8.9%).

Mental Health Treatment Prior to Death

In the 3 months prior to death, more than twice the number of MDE suicides had more access to mental health treatment (pharmacological or psychological) than non-MDE suicides (67.7% vs 35.6%, respectively; $X^2 = 27.572$; $df = 1$; $P < .001$). MDE suicides were more often prescribed antidepressants and benzodiazepines than non-MDE suicides. Antidepressants were prescribed in 21.5% of the MDE suicides, while only 4.4% of the non-MDE suicides did so ($X^2 = 16.214$; $df = 1$; $P < .001$). Significant differences were also found in the prescription of benzodiazepines (33% and 13.3%, respectively; $X^2 = 14.647$; $df = 1$; $P < .001$).

Substances and Drugs Detected Moments After Death

As shown in Table 2, antidepressants were found in 17/200 blood samples of MDE suicides and in 5/113

Table 2.

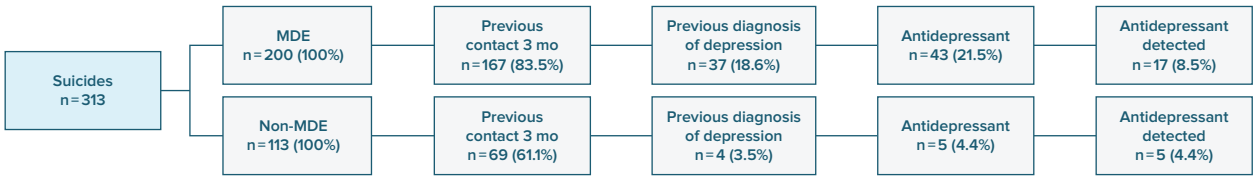
Toxicological Findings After Autopsy

	MDE N = 200	Non-MDE N = 113	Differences between groups
Substances detected in blood	N (%)	N (%)	
Tricyclic antidepressants	2 (1.0)	1 (0.9)	$X^2 = 0.010$; $df = 1$; $P = .920$
Non-TC antidepressants	15 (7.5)	4 (3.5)	$X^2 = 1.986$; $df = 1$; $P = .159$
Total antidepressants	17 (8.5)	5 (4.4)	$X^2 = 1.835$; $df = 1$; $P = .176$
Benzodiazepines	48 (24.1)	13 (11.5)	***X*² = 7.677; *df* = 1; *P* = .006**[a]
Ethanol	40 (20.0)	31 (27.4)	$X^2 = 2.275$; $df = 1$; $P = 0.131$
Ethanol (≥0.4 g/L)[b]	24 (12.0)	19 (16.8)	$X^2 = 1.412$; $df = 1$; $P = .235$

[a]Boldface indicates statistical signficance.
[b]Ethanol levels above 0.4 g/L have been interpreted as ethanol consumption moments prior to death,[49] as low blood alcohol concentration may be due to ethanol production by bacteria during decomposition.
Abbreviations: MDE = major depressive episode, TC = tricyclic.

Figure 1.

Antidepressants Detected in Blood in Suicidal Individuals and Their Relationship With Previous Contact With Health Services, Previous Diagnosis of Depression, and Prescription of Antidepressants



Abbreviation: MDE = major depressive episode.

non-MDE suicides. However, the presence of benzodiazepines was detected to a greater extent in both MDE suicides (24.1%) and non-MDE suicides (11.5%), with significantly higher percentages in MDE suicides ($X^2 = 7.677$; $df = 1$; $P = .006$) (Figure 1). The presence of blood ethanol positives was similar in both groups, but the median blood ethanol concentration was 1.26 g/L in MDE suicides and 0.84 g/L in non-MDE suicides.

Suicide Risk Factors for Previous Suicidal Behavior

More MDE suicides had presented suicidal ideation or a suicide attempt prior to their death than non-MDE suicides (82.4% vs 56.8%, respectively; $X^2 = 17.843$; $df = 1$, $P < .001$). Suicide attempt was detected in 52.5% of MDE suicides compared to 28.3% of non-MDE suicides ($X^2 = 17.843$; $df = 1$; $P < .000$) (Table 1).

History of Suicidal Behavior

Regarding presuicide communication of death or suicidal ideation, MDE suicides communicated their wish to die more frequently than non-MDE suicides before the last month (64.6% vs 40.5%; $X^2 = 17.064$; $df = 1$; $P < .001$).

Depression, Impulsivity, and Aggressivity

MDE suicides and non-MDE suicides differed in clinical and sociodemographic risk factors for suicide; scores on the SAD scale and the NO HOPE scale were higher in MDE suicides than in non-MDE suicides. Compared to non-MDE suicides, MDE suicides were more likely to be female (29.6% vs 15.9%, $X^2 = 7.169$; $df = 1$; $P < .007$), be elderly (64.8% vs 49.6%, $X^2 = 7.169$; $df = 1$; $P < .008$), have depression (84.4% vs 18.8%, $X^2 = 127.996$; $df = 1$; $P < .000$), have previous attempts (52.8% vs 28.3%, $X^2 = 17.843$; $df = 1$; $P < .000$), have suicidal plan (26.6% vs 8.9%, $X^2 = 13.756$; $df = 1$; $P < .000$), have a meaningless existence (26.6% vs 17.0%, $X^2 = 4.034$; $df = 1$), and maintain reasons for not living (13.1% vs 4.5%, $X^2 = 5.845$; $df = 1$; $P < .016$) (Table 3).

MDE suicides obtained significantly higher mean scores on the Beck depression scale than non-MDE suicides (26.5 and 11.8, respectively, FET = 3.54; $P < .001$) on the MADRS scale (32.23 and 17.5, respectively, FET = 5.48; $P < .001$).

MDE suicides had lower mean scores on the Brown-Goodwin lifetime history of aggression and Barratt impulsivity scales, but the mean differences were not statistically significant for any of these scales, except for the Barratt unplanned impulsivity subscale (Table 3).

Logistic Regression Model

Using the backward stepwise logistic regression model, 72.7% of the suicides were correctly classified: 81.9% of MDE suicides and 56.3% of non-MDE suicides.

Table 3.

Rating Scales for Depressive Symptoms, Impulsivity, and Aggressivity

	MDE (N = 200)	Non-MDE (N = 113)	Significance
SCID-I. Diagnostic items of MDE	N (%)	N (%)	
Sadness for more than 2 wk	189 (96.9)	20 (48.8)	$X^2 = 81.872$; $df = 2$; $P < .001$
Anhedonia	173 (88.7)	14 (35.9)	$X^2 = 58.573$; $df = 2$; $P < .001$
Changes in appetite	129 (66.5)	7 (23.3)	$X^2 = 20.298$; $df = 2$; $P < .001$
Changes in sleep	166 (85.2)	21 (45.7)	$X^2 = 36.513$; $df = 2$; $P < .001$
Changes in psychomotor function	143 (75.3)	4 (12.9)	$X^2 = 50.338$; $df = 2$; $P < .001$
Loss of energy	162 (85.3)	6 (20)	$X^2 = 63.383$; $df = 2$; $P < .001$
Feelings of worthlessness/guilt	135 (70.1)	6(20.0)	$X^2 = 32.927$; $df = 2$; $P < .001$
Loss of concentration	126 (66.3)	5 (16.7)	$X^2 = 27.742$; $df = 2$; $P < .001$
Thoughts of death or suicide	162 (84.3)	15 (50.0)	$X^2 = 20.960$; $df = 2$; $P < .001$
Clinically significant impairment or discomfort	175 (98.3)	4 (30.8)	$X^2 = 93.876$; $df = 2$; $P < .001$
Beck Depression Inventory	N = 54	N = 10	
Average score	26.5	11.8	$T = 3.54$; $P = .001$
MADRS	N = 152	N = 20	
Average score	32.23	17.5	$T = 5.48$; $P < .001$
Lifetime aggression scale (Brown-Goodwin)	N = 200	N = 112	
Average score	12.99	14.93	NS
Childhood subscale	2.59	3.75	NS
Adolescence subscale	3.35	4.63	NS
Adulthood subscale	7.06	6.63	NS
Barratt Impulsiveness Scale (assesses impulsivity)	N = 195	N = 110	
Average score total	51.16	54.53	NS
Motor subscale	18.91	18.51	NS
Unplanned impulsivity subscale	19.17	22.36	$T = -2.311$; $df = 303$; $P = .022$
Cognitive subscale	13.07	13.66	NS

Abbreviations: MADRS = Montgomery-Asberg Depression Rating Scale, MDE = major depressive episode, NS = nonsignificant ($P > .05$), SCID = Structured Clinical Interview for DSM.

The Hosmer-Lemeshow test was nonsignificant ($X^2 = 5.161$; $df = 8$; $P = .74$). MDE suicides were 2.8 times more likely to be diagnosed with depression, 2.3 times more likely to be in contact with mental health, and 2.4 times more likely to be in treatment with antidepressants (see Table 4 for a complete description of the differentiating characteristics of MDE suicides and non-MDE suicides).

DISCUSSION

In this study, we have explored the characteristics of 313 people who died by suicide, finding large differences between the results of the psychological autopsy and the diagnosis and care received before death.

Diagnosis, Healthcare Contact, and Treatment

We found that, according to the psychological autopsy, the majority of our sample had an MDE at the time of death. Studies such as Conner's have demonstrated substantial accuracy (based on κ) of diagnoses obtained by interviewing patients and proxy respondents, especially in substance dependence, bipolar disorder, and depression.[44,59–62] Specificity was high and false positives were minimal.[44] However, only one-fifth of those presenting with MDE had received a previous diagnosis of depression during their lifetime. These results are in line with what is found in previous literature: most studies show that few suicides are diagnosed with depression before their death and few are treated with antidepressants,[2,4,5,8,11,25,36,37,63] despite having had a high percentage of contact with a health service in the previous months, mainly with primary care and, to a lesser extent, with mental healthcare.[5,7,8,10,11,25,63] This may represent a lost opportunity to provide adequate treatment to people with an MDE and to assess the individual's risk of suicide.

In our study, we found that the MDE group was more likely to have contacted health services. It is possible that the presence of depressive symptoms leads to more frequent visits to health care services, even if this did not result in a correct diagnosis and treatment. In addition, we observed that MDE suicides attended mental health services more frequently than

Table 4.
OR Estimates for Logistic Regression Model Variables for Suicides

Variable	β[a]	OR = Exp (β)	95% CI
Male (female reference category)	−1.178	0.308	0.169–0.901
Chronic disease (no reference category)	−0.537	0.584	0.320–1.065
Diagnosis of depression (no reference category)	1.025	2.786	0.892–8.704
Diagnosis of schizophrenia (no reference category)	−1.444	0.236	0.065–0.852
Treatment with antidepressants (no reference category)	0.883	2.417	0.817–7.155
Treatment with benzodiazepines (no reference category)	0.639	1.894	0.936–3.832
Contact with mental health (no reference category)	0.838	2.311	1.128–4.734
NO HOPE (no reference category) score	−0.366	0.693	0.469–1.025
SAD PERSONS (no reference category) score	0.361	1.435	1.218–1.691

[a]β = regression coefficient.
Abbreviation: OR = odds ratio.

non-MDE suicides. According to the literature, the presence of severe externalizing symptoms and a history of hospitalization following a suicide attempt are most likely to facilitate accurate identification of mood disorders when reported by a family member, as underreporting is common.[44,64]

Although people with MDE were 5 times more likely to be prescribed antidepressants, only a fifth of MDE suicides had been prescribed antidepressants in the months prior to suicide, and less than a half of them were actually taking them according to toxicological tests. According to the literature consulted, the presence of antidepressants in blood samples of suicides is usually positive in 10%–20% of deaths by suicide.[26,33,36,39,41,65–71] Most of these studies had no information on whether or not the analyzed cases had a diagnosis of depression. This lack of adherence in similar studies may be related to an increased risk of completed suicide. Thus, the need to monitor treatment in severely ill patients is a strategy that may help improve treatment efficacy and contribute to the prevention of suicide.[37,39] Adherence to antidepressant treatment, studied in people with self-harm attempts, also demonstrates a lower risk of relapse and thus suicide risk.[37] In a survival analyses performed among previous suicide attempters, the authors found that good treatment compliance was associated with a decreased risk of reattempting suicide.[72]

Clinical Features of Depression

Severity of the depressive disorders is associated with a higher risk of suicide,[23,73–76] and the melancholic subtype is in turn associated with greater severity.[77,78] In our study, scores on scales assessing depressive symptoms such as the BDI and MADRS were consistently higher in MDE suicide. These differences were mainly in the items related to melancholic symptoms, such as pessimism, dissatisfaction, social withdrawal, motor slowing, insomnia, fatigue, and loss of appetite or weight loss. Moreover, the results on the NO HOPE scale were higher in MDE suicide, in line with the presence of severe depressive and melancholic symptoms with greater hopelessness and lower motives for living than in non-MDE. However, other studies have found no relationship between the severity of suicide and depression with melancholic features.[79] Thus, the influence on the risk of suicide among the different melancholic characteristics is still controversial,[23,75] although recent studies are beginning to associate melancholic depression with increased presence of suicidal ideation[77,80] and behaviors.[80] Some of the melancholic characteristics that seem to be more strongly associated with increased suicidal risk are anhedonia[81–83]; insomnia (odds ratio [OR] = 2.37),[23,74,76,81,84] especially in patients with schizophrenia and depression; agitation[81,85]; hopelessness (OR = 2.20)[74,75,86] and feelings of guilt (OR = 2.40).[76,83,87,88] Further studies should determine whether melancholic symptoms may be a risk factor for suicidal behavior in patients with depression and whether melancholia can be considered a separate diagnostic entity from major depressive disorder.[78,89]

Impulsivity was higher in non-MDE, although significant differences were found only in the item of lack of suicidal planning. However, both groups had higher than expected scores on the BIS scale, compared with previous studies.[56] They also had high scores on the Brown-Goodwin vital aggressiveness scale, although there are no data yet that it has a predictive value for suicide.[58] Some studies suggest that impulsivity is not a trait of suicidal individuals, but rather of suicide attempters.[90] Impulsivity is a well-known risk factor for suicidal behavior[91] and is inversely associated with lethality.[90] Previous studies have shown that attempters tend to be more impulsive, are associated with low lethality, and the absence of depression than suicide ideators.[90,92] In attempters who were not impulsive tended to have a diagnosis of EDM.[93] Impulsivity appears to be more implicated in suicide deaths at younger ages.[94] Our data suggest that MDE suicides had more suicidal ideation and planning than non-MDE suicides, as well as more previous suicide attempts. Thus,

there is a higher risk of suicide when there is an MDE in reattempters, as it will be less impulsive and more planned.

There is a high prevalence of depression and consumption disorders in suicidal individuals, which are often comorbid.[95] Alcohol is the substance most implicated in suicidal behavior due to its widespread use in our society.[96] Acute and chronic alcohol use—presumably through its effects on increased impulsivity, psychological distress, generation of interpersonal conflicts and loss of the ability to use coping strategies—increases suicide risk in predisposed individuals,[97–101] even more so if combined with other substances such as cocaine.[102–104] Alcohol use and abuse was more common in non-MDE suicides, but the amount of ethanol ingested was higher in MDE suicides. Both groups had higher consumption than the general population.[105,106] Ethanol levels above 0.4 g/L have been interpreted as ethanol consumption moments prior to death,[107] as low blood alcohol concentration may be due to ethanol production by bacteria during decomposition or traumatic death.

History of Suicidal Behavior

Previous studies found that about 75% of the suicides had not made any previous suicide attempt.[108,109] In contrast, in our study, we obtained a lower value: only 56% of our sample had no previous history of suicide attempts. Also, we found that MDE suicides had almost twice as any suicides attempts as non-MDE suicides (58.8% vs 28.3%), and they also had more suicidal ideation. If the diagnosis of depression was made in life, 61% of the suicides had made a previous attempt, which surely indicates that persons seen for a previous suicide attempt may be better diagnosed as MDE. Previous suicide attempts are one of the strongest risk factors for death by suicide, as is stated by several explanatory models of suicide. There is a higher risk of suicide in attempts with MDE, and a large proportion of suicide attempts are related to MDE. However, as with other risk factors, a history of suicide attempt lacks specificity for predicting individual suicide risk,[110] as 98% of subjects do not commit suicide in the first year after the attempt.[111,112] There were also statistically significant differences between the 2 groups regarding previous communication of death and suicidal ideation. Thus, MDE suicides were more likely to have reported wish to die or suicidal ideation in the weeks and months previous to suicide.

Strengths and Limitations

In this study, we have used a sample of people who died by suicide. Exploring the risk factors for death by suicide is crucial but still represents a gap in research as this is a rare event. In addition, the present study compares the differences presented by suicide victims regarding the presence or absence of a MDE. It is unusual to look for differences within the group of suicide victims, which may point to the presence of 2 types of populations and help to clarify the more specific risks of each of these subpopulations in the future, since suicide does not always occur in the context of a MDE.

The main limitation of our study is inherent to the psychological autopsy method: it is not the person who dies by suicide, but a proxy—usually a family member—who provides the information required to establish a diagnosis and the treatment prescribed. There are factors that may bias this information such as the degree of closeness with the deceased, the possibility of maximization or minimization of certain symptoms,[113,114] or the fact that the responses may be affected by grief.[115] There is also the possibility that relatives with mental disorders were better able to identify symptoms similar to their own in their deceased relative.[47,48,103,105] Another bias in psychological autopsy studies is the "Search after meaning" bias, in which each informant may focus more on the search for internal (mental disorder) or external (life events) causal factors that explain what happened.[116,117] However, psychological autopsy is the best method available for the study of completed suicides and is endorsed by expert groups.[38,118] Diagnoses are unlikely to be due to chance or interviewer and reporter bias.[104] The use of protocolized and standardized interviews, such as ours, lends validity to the results obtained.[119,120]

As in previous studies, the findings of this study are not sufficient to develop a predictive model for suicidality. Factors such as the presence of previous suicide attempts, an MDE, or the use of antidepressants, which may indicate a more severe condition, are helpful to the clinician but remain nonspecific for predicting individual risk.

Conclusion

The results of this study guide us to the presence of some factors that can be warning signs for the clinician to improve the identification of patients who are going through an MDE and have a higher risk of suicide. Verbalization of suicidal ideation, melancholic symptoms, and hopelessness should be aspects to explore in a patient with depression, even more so if they are present before the development of the depressive episode. It is also important to monitor treatment with antidepressants, to know if the patient is taking them and, if not, what is the reason for abandoning treatment. The underdiagnosis of depression in people who die by suicide is striking, as is the undertreatment. Further efforts must be made to train primary care physicians in the proper identification of persons at risk of suicide, as they are one of the main gatekeepers in the fight for suicide prevention.

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