Suicide in Schizophrenia: An Observational Study of Coroner Records in Toronto

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ABSTRACT

Objective: Suicide is an important cause of premature mortality in people suffering from schizophrenia. This study aimed to identify demographic, personal, and suicide-specific features that distinguish suicide in people with schizophrenia from those with another severe mental illness (bipolar disorder) and those with neither illness.

Method: We conducted a coroner's chart review for 2,886 suicide victims in Toronto from 1998 to 2010. Diagnoses were made based on coroner interviews with available informants including family members, acquaintances, the deceased's physician(s) and/or review of medical records. Of the total, 258 formed what we defined as the schizophrenia group (204 schizophrenia, 34 unspecified psychotic illness, and 20 schizoaffective disorder). Of the remainder, 169 had bipolar disorder, and 2,459 had neither illness. One-way analysis of variance (ANOVA) tests and χ^2 tests were conducted to examine differences between the groups.

Results: The group with schizophrenia was the youngest (mean age for schizophrenia, 41.0 years; bipolar disorder, 43.3 years; and neither, 47.7 years; $P < .001$), most likely to have never been married (schizophrenia, 75.6%; bipolar disorder, 57.4%; and neither, 52.9%; $P < .001$), most likely to be living in temporary/assisted housing or jail (schizophrenia, 9.3%; bipolar disorder, 5.4%; and neither, 3.2%; $P < .001$), and least likely to have experienced a recent stressor (schizophrenia, 26.7%; bipolar disorder, 37.9%; and neither, 54.1%; $P < .001$). The schizophrenia group was the most likely to use a violent cause of death, specifically by fall from a height or by jumping in front of a vehicle (schizophrenia, 81.4%; bipolar disorder, 58.0%; and neither, 73.1%; $P < .001$).

Conclusions: There are important demographic and suicide-related differences between suicide victims with and without schizophrenia. Notably, suicide in schizophrenia overall appears to be more illness driven and occurs by more violent means than in the bipolar disorder group or those with neither illness.

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Suicide is a tragic outcome that occurs frequently in people suffering from schizophrenia. The lifetime rate has historically been reported as 10%,[1,2] although more recent analyses estimate the rate to be 4%–5%.[3,4] Risk of suicide is highest in the first year after diagnosis but remains high in the subsequent decade and beyond.[5–7] Well-known risk factors for suicide in schizophrenia include male gender,[8–10] previous suicide attempts,[10–17] and comorbid depressed mood or depressive disorder.[12–15,18–20] In addition, a systematic review found higher risk of suicide in schizophrenia in those with drug abuse, psychomotor agitation, fears related to mental deterioration, nonadherence to treatment, and recent loss.[21]

It has been postulated that the irrational or disorganized thinking characteristic of psychosis may itself predispose people to suicide.[20] This theory is supported by several studies[12,19] including a nationwide Finnish cohort study that found 78% of suicide victims with schizophrenia to be in the acute phase of their illness at the time of death.[22] A recent prospective study of adolescents found that 20% of those reporting psychotic symptoms at baseline had a suicide attempt over 12 months compared to only 2.5% in those not reporting psychotic symptoms.[23] This included a 70-fold increased risk of suicide attempt within 2 weeks of the initial assessment if psychotic symptoms were reported.

People suffering from schizophrenia who die from suicide may be distinct from other suicide victims in important ways. First, they are much more likely to attempt and die from suicide by jumping from heights or in front of vehicles.[8,14,17,24–27] They are more likely to have impulsive-aggressive traits,[28] and their suicidal behavior may be provoked more frequently by the actual illness rather than acute stressors. For example, a Japanese study of suicide attempters with schizophrenia compared to attempters with mood disorders found that the "motive" for suicide in those with schizophrenia was more often their mental illness (45% vs 19%, respectively) compared to other stressors such as relational, physical, or financial problems, which were much more common in the mood disorders group.[25]

This study seeks to compare demographic, personal, and suicide-specific characteristics between suicide victims with schizophrenia, with another severe mental illness (bipolar disorder), and with neither illness in order to understand how suicide differs between these groups and to inform future suicide prevention strategies.

METHOD

Setting and Sample

The Office of the Chief Coroner of Ontario granted us access to its records for the purposes of this research. The method of data collection has been previously described.[29] Data were collected from coroner's charts for all deaths ruled as suicides, according to a standard of a high degree of probability, occurring in the city of Toronto, Ontario, from 1998 to 2010 inclusive. There were 2,886 suicide deaths in the city of Toronto during that period. Data were abstracted by the primary investigator

Clinical Points

- Important differences exist between people who die from suicide who have schizophrenia, bipolar disorder, or neither disorder.
- Suicide victims with schizophrenia are less likely to experience a recent stressor, and their deaths may be more illness-driven in general.
- Female suicide victims with schizophrenia are older than male victims with schizophrenia but have similar rates of contact with mental health care prior to death and use similarly violent means.

(M.S.) and 2 research assistants. A standardized procedure of data abstraction was followed, and the investigators and research assistants were in continuous contact to resolve questions about how to code each chart while maintaining consistency.

For each death, the coroner conducted an investigation that often included direct interviews with family members, acquaintances, and, in some cases, an interview with the deceased's physician(s) and/or review of medical records. A determination of psychiatric diagnosis is an important component of the investigation given its potential relevance in understanding the cause of death. Reports, copies of documents, and interview transcripts available in the coroner's chart were reviewed. Deaths were separated into 3 categories of interest: (1) people identified as having schizophrenia or a schizophrenia spectrum illness (schizoaffective disorder, psychotic illness), (2) people identified as having bipolar disorder (chosen as a major mental illness comparator group for its size and likely diagnostic reliability), and (3) people who died of suicide without an identified diagnosis of schizophrenia or bipolar disorder. This third group included a large cohort of people described as depressed[29] who most likely fit into several different diagnostic categories that could not be reliably established. Also included were much smaller subsets of individuals with anxiety, eating, or personality disorders, but these were likely underdetected, as well as people with no previously identified mental illness. Given the greater diagnostic uncertainty in this group, we chose not to further subdivide it; however, we did include it to provide context for how the schizophrenia and bipolar disorder groups differ from the majority of suicide victims.

Data Abstracted

Data were abstracted from the coroner's investigation report, pathologist's report, and commonly other sources of information such as police reports, letters from family members, and copies of suicide notes. Data for each variable of interest were available in most but not all charts. In addition to data on the presence of mental illness, data collected included: (1) demographics: age, sex, marital status, and living circumstances; (2) recent stressors (noted to have occurred or caused distress within the last year) including bereavement, unemployment/job stressor, financial problems, relationship breakup, interpersonal conflict, recent medical stressors (including being upset about a diagnosis, diminishing health, or loss of independence due to a medical condition), and criminal justice involvement; (3) history of substance abuse (defined as known history of either recreational drug or alcohol use or both); (4) contact with a hospital/emergency room or psychiatrist within 7 days prior to suicide; (5) method of suicide; and (6) other details of the suicide including location of death and the presence of a suicide note. Suicide deaths by self-poisoning and nonhanging asphyxia (carbon monoxide poisoning) were considered nonviolent, while all other methods were considered violent.

Statistical Analysis

All statistics were performed using IBM SPSS Statistics 20 (SPSS Inc, Chicago, Illinois). The primary analysis used 1-way analysis of variance (ANOVA) tests with Tukey honestly significant difference post hoc tests and χ^2 tests to examine differences between continuous and categorical variables, respectively. Pairwise comparisons used independent t tests and χ^2 tests. A Bonferroni correction was performed to account for multiple statistical tests with a threshold for significance set at .002.

RESULTS

Schizophrenia Sample and Comparator Groups

Of the 2,886 suicide victims, 204 were identified as having schizophrenia, 34 had an unspecified psychotic illness, and 17 had schizoaffective disorder; 3 people had diagnoses of schizophrenia and bipolar disorder, and they were treated as having schizoaffective disorder. These 258 people constitute the schizophrenia and schizophrenia spectrum group, hereafter described simply as the schizophrenia group. There were 169 people identified as having bipolar disorder, and 2,459 who were not identified as having either schizophrenia or bipolar disorder. Given the possible overlap between schizoaffective disorder and bipolar disorder, the results shown below were replicated with the schizoaffective group removed, and there were no significant differences.

Demographic and Personal Characteristics

Demographic and personal variables between the 3 groups (schizophrenia, bipolar disorder, and neither) are shown in Table 1. The group with schizophrenia was numerically the youngest (mean age for schizophrenia, 41.0 years; bipolar disorder, 43.3 years; and neither, 47.7 years). Both the schizophrenia and bipolar groups were significantly younger than the neither group ($P < .001$). The group with schizophrenia was also the most likely to have never been married (schizophrenia, 75.6%; bipolar disorder, 57.4%; and neither, 52.9%; $P < .001$), most likely to be living in temporary/assisted housing or jail (schizophrenia, 9.3%; bipolar disorder, 5.4%; and neither, 3.2%; $P < .001$), and least likely to have experienced a recent stressor (schizophrenia, 26.7%; bipolar disorder, 37.9%; and neither, 54.1%; $P < .001$).

Table 1. Comparison of Demographic and Personal Variables for People With Schizophrenia, Bipolar Disorder, or Neither Who Died of Suicide in Toronto From 1998 to 2010

Variable	A Schizophrenia[a] (n = 258)	B Bipolar Disorder (n = 169)	C Neither (n = 2,459)	Statistic[b]	*df*	*P*	Pairwise Comparisons
Mean age, y	41.0	43.3	47.7	20.9	2	<.001	A = B < C*
SD [95% CI]	13.5 [39.4–42.7]	13.5 [41.3–45.4]	18.1 [47.0–48.5]				
Age, % y				62.2	8	<.001	A = B, A ≠ C[c]*
≤ 19	2.3	0.6	3.4				
20–34	32.2	27.8	22.1				
35–49	40.7	41.4	32.3				
50–64	18.6	24.9	23.8				
≥ 65	6.2	5.3	18.5				
Sex, % male	68.2	56.8	72.0	19.2	4	.001	A = B, A = C
Marital status, %				70.9	8	<.001	A ≠ B[d]*, A ≠ C[e]*
Single	75.6	57.4	52.9				
Married	10.9	20.1	27.1				
Divorced/separated	12.4	22.5	15.0				
Widowed	1.2	0	4.9				
Living circumstances, %				50.6	12	<.001	A = B, A ≠ C[f]*
Alone	42.6	47.3	42.5				
With family/friend/roommate	44.2	46.2	52.3				
Shelter/hostel/hotel/rooming house	5.0	3.0	2.0				
Nursing home/retirement residence	1.6	1.2	0.9				
Group home/housing for mentally ill	1.9	1.2	0.1				
Jail	0.8	0	0.2				
Other/unspecified	3.9	1.2	2.0				
Any stressor in past year, %	26.7	37.9	54.1	81.7	2	<.001	A = B, A < C*
Specific stressor in past year, %							
Interpersonal conflict	11.2	15.4	17.9	7.58	2	.02	A = B, A = C*
Financial	6.6	11.8	19.5	31.1	2	<.001	A = B, A < C*
Employment	2.7	8.9	10.4	16.0	2	<.001	A = B, A < C*
Intimate partner breakup	2.3	5.9	9.0	15.1	2	.001	A = B, A < C*
Criminal legal	8.1	4.7	6.0	2.44	2	.296	A = B, A = C
Bereavement	3.1	5.9	5.8	3.23	2	.198	A = B, A = C
Medical health	3.1	3.6	13.5	36.3	2	<.001	A = B, A < C*
Past suicide attempts, %	36.4	46.7	24.7	51.7	2	<.001	A = B, A > C*
Substance abuse, %	19.8	26.0	19.8	3.79	2	.150	A = B, A = C

[a]For the purposes of this analysis, the definition of schizophrenia was broadened to include people identified as having schizoaffective disorder or another primary psychotic illness.
[b]All values are χ^2, except for mean age, which is the *F* score.
[c]$\chi^2_4 = 39.0$, $P < .001$.
[d]$\chi^2_3 = 19.3$, $P < .001$.
[e]$\chi^2_3 = 54.2$, $P < .001$.
[f]$\chi^2_8 = 60.2$, $P < .001$.
*$P < .001$.

There were no significant differences in rates of substance abuse between groups.

Details of Suicide and Events Immediately Preceding It

Variables related to the suicide death are shown in Table 2. The schizophrenia group was most likely to use a violent cause of death (schizophrenia, 81.4%; bipolar disorder, 58.0%; and neither 73.1%), differing significantly from the bipolar disorder group ($P < .001$) but not the neither group. Specifically, those with schizophrenia were more likely to die by fall from a height (schizophrenia, 42.2%; bipolar disorder, 24.9%; and neither 22.4%; $P < .001$) or by jumping in front of a vehicle such as a subway or train (schizophrenia, 13.6%; bipolar disorder, 5.3%; and neither, 7.4%; $P < .001$). They were less likely than either of the other groups to die by firearm (schizophrenia, 0.4%; bipolar disorder, 2.4%; and neither, 5.5%; $P < .001$). They were the least likely to leave a note (schizophrenia, 16.3%; bipolar disorder, 34.9%; and neither, 31.7%; $P < .001$) and most likely to have a known contact with a psychiatrist or emergency department in the past week (schizophrenia, 22.1%; bipolar disorder, 14.8%; and neither, 6.1%; $P < .001$).

Schizophrenia Deaths by Gender

Women comprised 82 of the 258 deaths in the schizophrenia group. Compared to the males with schizophrenia, the women with schizophrenia tended to be older (mean age = 44.2 years vs 39.5 years, respectively, $P = .009$) and were more likely to have been married, divorced/separated, and widowed (17.1% vs 8.0%, 22.0% vs 8.0%, and 2.4% vs 0.6%, respectively; $P < .001$). There were no differences between females and males in rates of past suicide attempts (41.5% vs 34.1%, respectively, $P = .252$), recent psychiatric or emergency contact (22.0% vs 22.2%, respectively, $P = .970$), or rates of having had a recent stressor (29.3% vs 25.6%, respectively, $P = .532$). Methods of suicide used were not statistically different ($P = .078$), with similar numbers of women jumping from height (42.7% vs 42.0%)

Table 2. Comparison of Details of Suicide Death and the Events Immediately Preceding It for People With Schizophrenia, Bipolar Disorder, or Neither Who Died of Suicide in Toronto From 1998 to 2010

Variable	A Schizophrenia[a] (n = 258)	B Bipolar Disorder (n = 169)	C Neither (n = 2,459)	χ^2	*df*	*P*	Pairwise Comparisons
Violent cause of death, %[b]	81.4	58.0	73.1	28.5	2	< .001	A > B*, A = C
Specific cause of death, %				131.6	18	< .001	A ≠ B,[c]* A ≠ C[d]*
Hanging	16.3	17.8	31.2				
Fall from height	42.2	24.9	22.4				
Self-poisoning	17.4	34.9	18.8				
Subway/train/collision	13.6	5.3	7.4				
Nonhanging asphyxia (carbon monoxide poisoning)	1.2	7.1	8.1				
Firearm	0.4	2.4	5.5				
Cutting/stabbing	5.0	3.0	3.1				
Drowning/hypothermia	2.3	3.0	2.4				
Fire/burns/electrocution	1.6	1.8	1.1				
Suicide note left, %	16.3	34.9	31.7	27.8	2	< .001	A < B,* A < C*
Contact with psychiatry/emergency services in past week, %	22.1	14.8	6.1	91.9	2	< .001	A = B, A > C*

[a]For the purposes of this analysis, the definition of schizophrenia was broadened to include people identified as having schizoaffective disorder or another primary psychotic illness.
[b]All suicide deaths not occurring by self-poisoning or other asphyxia are considered violent.
[c]$\chi^2_8 = 43.3$, $P < .001$.
[d]$\chi^2_9 = 96.8$, $P < .001$.
*$P < .001$.

and in front of subways/trains/vehicles (9.8% vs 15.3%) compared to men.

DISCUSSION

Demographic and Personal Factors

The present findings first and foremost affirm what has been well established over the years, that is, the risk of suicide in individuals with major mental illness such as schizophrenia[8] and bipolar disorder.[30] As noted earlier, from a historical perspective, the lifetime rate of suicide in schizophrenia is routinely identified to be in the range of 10%,[1,2] although a lower estimate has been reported more recently, in the range of 4%–5%.[3,4] While the intent of this investigation was not to address this question specifically, it is worth pointing out that a calculated estimate based on Toronto's population (approximately 2.5 million between 1998 and 2010)[31] and the reported lifetime prevalence of schizophrenia (0.3%–0.7% of the population)[32] yields an estimate of approximately 12,500 people in Toronto who have or will get the disorder. Using this figure, our results suggest that approximately 2% of people with schizophrenia died of suicide over the 14-year period. This would seem to support a lifetime estimate between 5% and 10%.

Suicide is known to be a risk factor in the earliest stages of schizophrenia, with other investigations reporting mean ages of suicide in the late 20s or mid-30s.[12,17,24] However, this study detected a somewhat higher mean age for suicide death in schizophrenia (41 years), underscoring the fact that older individuals are not without risk, a finding that is in line with other reports.[13,22,33–36] That the proportion of suicide victims aged ≥ 65 years with both schizophrenia and bipolar disorder was relatively low (6.2% and 5.3%, respectively, compared to 18.5% in the neither group) underscores that people with these disorders may die from suicide at somewhat younger ages than other suicide victims. It may also reflect the fact that there are simply fewer people with both schizophrenia and bipolar disorder in this age group due to premature mortality related to both suicide as well as physical illness.[37] These results highlight that suicide risk differs according to age for people with schizophrenia but that all age groups remain vulnerable.

A number of other demographic findings align with what we might expect based on our understanding of these illnesses. For example, individuals with schizophrenia were more likely to be male, single, and unemployed, all identified risk factors for suicide.[8] Gender was identified as a significant variable in our study. The near 1:1 ratio of males to females in the bipolar sample is in line with other evidence indicating that suicide rates are more comparable between the genders in bipolar disorder.[38] Perhaps the most notable gender finding was the lack of difference in method, including violent methods such as jumping, between genders in the schizophrenia group since the literature suggests that women, as a group, are more likely to use nonviolent methods such as self-poisoning.[39] At least in this respect, women with schizophrenia appear to be more like men with the disorder than they are like women without schizophrenia. Living circumstances was also identified as a significant variable, and those with schizophrenia were more likely to be living in some kind of supportive housing (eg, group home).

Perhaps the most notable finding of this study is that only slightly more than 25% of individuals with schizophrenia were identified as having a clear stressor in the previous year. At first blush, this may seem counter-intuitive given the impact schizophrenia has on lifestyle and functional outcome[40,41]; individuals with schizophrenia are routinely unable to work and, as demonstrated here, frequently are without intimate relationships (eg, marriage). Economically, it is important to bear in mind that in Canada provision for ongoing health care and monthly financial support, albeit

modest, is guaranteed to those with serious mental illness. Within this framework, recent evidence has indicated that those with schizophrenia report themselves to be as successful and satisfied as individuals in the general population.[42] Under such circumstances, suicide in schizophrenia may be more illness-driven, in agreement with other investigations.[11] On the other hand, a recent study found that 63% of suicide victims with schizophrenia had experienced a major life event within the past 12 weeks,[43] in contrast to what was seen in our sample. However, that particular study specifically focused on the potentially important role of life events, utilizing a scale that taps into 10 life domains.

Two final points warrant at least a brief comment. The first relates to substance abuse, which here was numerically highest in the bipolar sample (26%), as compared to only 19.8% for both schizophrenia and those with neither diagnosis. Substance abuse is generally associated with increased suicidality,[44] but the rate of substance abuse is considerably lower than what is routinely reported in schizophrenia.[45] Substance abuse was coded here if there was any identified history of routine ethanol/drug use, but these figures would suggest a unique population, at least vis-à-vis schizophrenia or underdetection. The second point relates to contact with health care services; not surprisingly, this variable was significant and lowest for those without a diagnosis (6.1%) versus bipolar disorder (14.8%) and schizophrenia (22.1%). Importantly, though, these figures include both regular and crisis visits, cautioning against the assumption that such information can be used to identify those at highest risk through increased use of services.

Suicide-Specific Factors

Notably, 55.8% of the schizophrenia sample in this study died of suicide either by jumping from a height or in front of vehicles; other reports have highlighted this same association, including in first-episode psychosis.[26,27] Rates of suicide death by these methods were considerably lower in people with bipolar disorder (30.2%) and those without either diagnosis (29.8%). In contrast, self-poisoning represented the most common cause of death in our bipolar sample (34.9%), while those with schizophrenia scored lowest of the 3 samples (17.4%). This is in keeping with previous findings that suicide victims with schizophrenia tend to die by more lethal means.[26,27,46–50] Further, indirect evidence of this can also be inferred from our finding that previous suicide attempts were higher in bipolar disorder.

In the present sample, people with schizophrenia left fewer suicide notes, giving rise to several possible explanations. In the face of a chronic illness and absence of specific stressors, it may be that individuals with schizophrenia felt less need to explain their decision to loved ones. The issue of close relationships, or lack thereof, may itself also be important. Our findings, like others, identify significantly fewer individuals with schizophrenia who are married, and the absence of more intimate relationships may influence the perceived need to explain their decision. Fewer suicide notes in this group may also reflect a diminished capacity to plan and formulate a note if a person is actively psychotic. There may also be practical obstacles to leaving a note related to the methods of suicide more commonly used in schizophrenia. That is, leaving a note may be somewhat less feasible for people who die by jumping in front of a subway compared to those who die from self-poisoning in their own home.

Studies of this sort face clear limitations, dependent as they are on large databases (in this case coroner's data) that are necessarily imperfect. For example, in this particular sample, diagnosis was based on medical records supplemented by collateral information, police reports, and personal records of the deceased that were available to the coroner but unavailable for external validation. That data may, at times, be retrospective challenges accuracy that could be even more relevant for specific outcome measures (eg, substance abuse). The second major weakness of a study of this sort is lack of living control groups, meaning we cannot clearly delineate those features in the samples being evaluated that are specific to suicidality. In other words, this study cannot identify features that differentiate people with schizophrenia who do and do not die from suicide. That is crucial information for ultimately formulating suicide prevention strategies, but additional comparative studies are first required to supplement the observational data we report. The strength of this study is the very large cohort of people with and without schizophrenia who died of suicide, an approach that is necessary if we are to better understand how suicide differs in people with schizophrenia from those with other forms of mental illness such as bipolar disorder.

CONCLUSION

The present investigation adds to a rather limited body of evidence looking at suicide in larger cohorts of patients with mental illness, in this case schizophrenia and bipolar disorder. As well as its size, it has the advantage of a third subsample with neither diagnosis for comparison purposes. Like other reports, the present findings affirm earlier evidence indicating increased risk of more violent forms of suicide, specifically jumping. In terms of demographics, it affirms that, in the case of schizophrenia, individuals are more likely to be male, single, unemployed, and living in supportive housing. We posit that collectively such factors contribute to a sense of social isolation translating to fewer suicide notes. The present findings call into question the importance of specific stressors in individuals with suicide, suggesting instead that the decision may be more illness driven. If we are to substantially enhance risk assessment over the longer term, it is essential that we integrate retrospective findings of the sort presented here with prospective data that are better suited to provide details of symptoms and events more immediate to the suicide.

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