Suicide Rates in Cancer Patients in the Current Era in United States

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Suicide rates are higher in cancer patients when compared with the general population. This is secondary to an increase in psychosocial stress due to poor prognosis of cancer and treatment-related morbidity (1–4). Improvements in cancer treatment and increased awareness relating to the higher risk for suicide in this population has resulted in a decline in suicide rates in some European countries (1, 5). However, a population-based retrospective study conducted in England during 1996–2005 revealed no change in the suicide rates in cancer patients (6). In the United States, a previous study based on the Surveillance Epidemiology and End Results (SEER) database concluded that cancer patients diagnosed during 1973–2002 were at double the risk of committing suicide when compared with the general population (7). The awareness about higher risk of suicide among cancer patients increased in the United States after a series of events such as the development of the National Strategy for Suicide Prevention by the U.S. Surgeon General in 2001 (8, 9). Moreover, awareness regarding the psychosocial needs of cancer survivors increased following initiatives by the National Cancer Institute (10). The survival rates of cancer patients has increased due to advancements in cancer treatment (11). However, there are no data on the risk of suicide in cancer patients in more recent years. The purpose of the present study was to estimate the suicide rates in cancer patients compared with the general population in the United States from 2000 onward. We further compared suicide rates among patients diagnosed in 2000–2006 and 2007–2013.

METHOD

Cancer patients over the age of 20 diagnosed from 2000 to 2013 with a cause of death as "suicide and self-inflicted injury" were identified in the SEER database. The SEER program is a population-based registry that collects data on cancer patients from nine SEER registries in the United States. Patients were excluded if the cancer was diagnosed during autopsy.

The SEER files include data on sex, age at diagnosis, race, marital status, surgical and radiotherapy treatment, reasons for not receiving treatment, latency period, and year at diagnosis. Data on anatomic site, stage, date of last follow-up, and vital status at last follow-up were also available. Information on chemotherapy and comorbid medical and psychiatric conditions was not available.

Statistical Analyses

Standardized mortality ratios and 95% confidence intervals were calculated (12). The follow-up time was calculated for each patient in years from the time of diagnosis to suicide. The number of years were then added to estimate person-years. Statistical analyses were performed with SEER Stat 8.3.2 (Surveillance Research Program, National Cancer Institute, Bethesda, Md. [https://seer.cancer.gov/data/]).

RESULTS

The demographic data and tumor characteristics in the two study periods are summarized in Table 1. The mean age of patients who committed suicide was 67.6 years and 66.4 years in 2000–2006 and 2007–2013, respectively. A total of 1,495 suicides were identified in 1,486,140 eligible cancer patients followed for 6,346,155 person-years. This resulted in a standardized mortality ratio of 1.37 (95% confidence interval [CI]=1.3–1.4) during 2000–2013, compared with the U.S. general population. The suicide rates were not significantly different in the two study periods (Table 2). The standardized mortality ratio at 0–12 months did not change significantly in 2007–2013 (2.21, 95% CI=1.9–2.5) compared with 2000–2006 (2.57, 95% CI=2.3–2.9). Likewise, the standardized mortality ratio in 1- to 5-year survivors remained stable in the two study periods, at 1.17 (95% CI=1.1–1.3) in 2000–2006 compared with 1.28 (95% CI=1.1–1.4) in 2007–2013 (Table 3). Among the patients who committed suicide, 84% were male, 89% were Caucasian, and 37% were over the age of 70 years. Ninety-two percent of patients had a single cancer, and in 47% the patient's cancer was localized or only regionally spread. Forty-six percent of patients did not receive any treatment, and approximately 2% refused definite treatment for any cancer. The suicide rates in all subgroups were higher than the general population. The sites with higher standardized mortality ratios were esophagus followed by pancreas, lung with bronchus, and oropharynx (Table 2). The risk was not different in the two study periods and was highest in the first year after cancer diagnosis. The suicide rate declined thereafter, with a leveling off after 5 years (Table 3).

TABLE 1. Demographic and Tumor Characteristics With Corresponding Suicide Rates in Cancer Patients Diagnosed During 2000−2013

Characteristic	2000−2013			2000−2006		2007−2013	
	Total Number of Cancer Patients (%)	Observed Suicide (%)	Standardized Mortality Ratio (95% CI)	Observed Suicide (%)	Standardized Mortality Ratio (95% CI)	Observed Suicide (%)	Standardized Mortality Ratio (95% CI)
Sex							
Male	768,420 (51)	1,255 (84)	1.39 (1.3−1.5)	812 (84)	1.29 (1.2−1.4)	443 (84)	1.61 (1.5−1.8)
Female	717,720 (49)	240 (16)	1.27 (1.1−1.4)	154 (16)	1.20 (1−1.4)	86 (16)	1.43 (1.1−1.8)
Race							
Caucasian	1,207,446 (81)	1,335 (89)	1.31 (1.2−1.4)	871 (90)	1.23 (1.2−1.3)	464 (87)	1.49 (1.4−1.6)
African American	154,082 (10)	57 (4)	1.62 (1.2−2.1)	32 (3)	1.34 (0.9−1.9)	25 (5)	2.2 (1.4−3.2)
Other	124,612 (9)	103 (7)	2.49 (2.1−3.1)	63 (7)	2.25 (1.7−2.9)	40 (8)	3 (2.1−4.1)
Age group							
20−44 years old	144,020 (10)	130 (9)	1.15 (0.9−1.4)	93 (10)	1.12 (0.9−1.4)	37 (7)	1.25 (0.9−1.7)
45−60 years old	406,955 (27)	419 (28)	1.29 (1.2−1.4)	266 (27)	1.22 (1.1−1.4)	153 (29)	1.45 (1.2−1.7)
60−70 years old	386,130 (26)	392 (26)	1.42 (1.3−1.6)	251 (26)	1.36 (1.2−1.5)	141 (27)	1.55 (1.3−1.8)
≥70 years old	549,035 (37)	554 (37)	1.46 (1.3−1.6)	356 (36)	1.31 (1.2−1.5)	198 (37)	1.81 (1.6−2.1)
Marital status							
Married	828,705 (56)	751 (50)	1.03 (1.5−1.9)	510 (53)	0.99 (0.9−1.1)	241 (46)	1.14 (1−1.3)
Single	204,145 (14)	238 (16)	1.90 (1.7−2.2)	147 (15)	1.75 (1.5−2.1)	91 (17)	2.19 (1.8−2.7)
Previously married	343,029 (23)	344 (23)	2.37 (2.1−2.7)	221 (23)	2.24 (2−2.6)	123 (23)	2.65 (2.2−3.2)
Unknown	110,261 (7)	162 (11)	1.67 (1.4−2)	88 (9)	1.43 (1.2−1.8)	74 (14)	2.09 (1.6−2.7)
Tumor stage							
Localized/in situ	1,001,074 (67)	413 (28)	1.14 (1−1.3)	277 (29)	1.1 (1−1.2)	136 (26)	1.23 (1−1.5)
Regional	137,527 (9)	296 (20)	1.96 (1.8−2.2)	184 (19)	1.81 (1.6−2.1)	112 (21)	2.29 (1.9−2.8)
Local regional (prostrate)	118,049 (8)	334 (22)	0.85 (0.8−0.9)	236 (24)	0.83 (0.7−0.9)	98 (19)	0.91 (0.7−1.1)
Distant	144,904 (10)	268 (18)	3.17 (3−3.6)	151 (16)	2.98 (2.5−3.5)	117 (22)	3.44 (2.9−4.1)
Unknown	85,441 (6)	184 (12)	1.75 (1.5−2.1)	118 (12)	1.69 (1.4−2.1)	66 (12)	1.88 (1.4−2.5)
Primary tumor							
Single	1,333,843 (90)	1,376 (92)	1.48 (1.4−1.6)	878 (91)	1.40 (1.3−1.5)	498 (94	1.66 (1.5−1.8)
Multiple	152,297 (10)	119 (8)	0.71 (0.6−0.9)	88 (9)	0.67 (0.5−0.8)	31 (6)	0.89 (0.6−1.3)
Treatment							
Treated	873,549 (59)	803 (54)	1.15 (1.1−1.2)	548 (57)	1.12 (1−1.2)	255 (48)	1.22 (1.1−1.4)
Not Treated	587,910 (40)	656 (44)	1.72 (1.6−1.9)	396 (41)	1.53 (1.4−1.7)	260 (49)	2.12 (1.9−2.4)
Refused Treatment	24,681 (1)	31 (2)	2.67 (1.8−3.8)	22 (2)	2.41 (1.5−3.7)	09 (2)	3.65 (1.7−7)

DISCUSSION

This study reveals that cancer patients in the United States are at 1.37-fold higher risk of committing suicide compared with the general population. The results of this study affirm the findings from previous studies that suicide rates are still higher in male sex, older age, advanced stage, and in patients with single cancer in the more recent period. The risk of committing suicide in the first year after diagnosis (2–11 months) was more than twice the overall risk and did not change across the two study periods.

TABLE 2. Suicide Rates in Cancer Patients at Selective Sites Diagnosed During 2000–2013 in the Surveillance Epidemiology and End Results Database

Cancer Type	2000–2013 Number of Observed Suicides	2000–2013 Standardized Mortality Ratio (95% CI)	2000–2006 Standardized Mortality Ratio (95% CI)	2007–2013 Standardized Mortality Ratio (95% CI)
All sites	1,495	1.37 (1.3–1.4)	1.27 (1.2–1.5)	1.58 (1.4–1.7)
Oral cavity and pharynx	95	3.36 (2.7–4.1)	3.14 (2.4–4.1)	3.79 (2.7–5.2)
Esophagus	21	3.85 (2.4–5.9)	3.58 (1.9–5.9)	4.27 (2–8)
Stomach	20	2.50 (1.5–3.9)	2.51 (1.3–3.9)	2.49 (1–5.1)
Liver	19	3.55 (2–5.5)	3.13 (1.4–5.5)	3.92 (2–7)
Pancreas	18	3.8 (2.3–6)	2.93 (1.2–6.0)	4.72 (2.4–8.5)
Larynx	20	2.04 (1.3–3.2)	2.18 (1.2–3.2)	1.72 (0.6–4)
Lung and bronchus	137	3.37 (2.8–4)	3.3 (2.6–4)	3.48 (2.6–4.6)
Myeloma	20	2.08 (1.3–3.2)	2.56 (1.4–3.2)	1.33 (0.4–3.1)

In a study using the SEER database, Misono et al. (7) concluded that U.S. cancer patients were at 2-fold higher risk (standardized mortality ratio=1.88, 95% CI=1.83–1.93) of committing suicide than the general population. However, their study was limited to cancer patients diagnosed during 1973–2002. The outcome of cancer patients has improved significantly in the previous decade.

The higher risk of committing suicide among patients with esophageal, pancreatic, hepatic, lung and bronchus, and oropharyngeal cancers is most likely related to the patient having a grave prognosis, low quality of life due to comorbid depression, the disease's impact on appearance, impaired vital functioning, and chronic pain. However, these results may be confounded by concomitant substance abuse and higher incidence of depression in these patients (1, 13–17).

Higher suicide rates in elderly white males mirror trends in the general population and have been attributed to the inability to handle stress due to a cancer diagnosis and the psychological brittleness in old age (18, 19) (see Table 1). The increased risk in the first year postdiagnosis has also been reported in other studies (20, 21) and may be related to disease behavior. During a highly aggressive disease, depression resulting from inadequately controlled pain and treatment failure could lead to hopelessness and suicide (1, 22). Surprisingly, our data suggest that the difference in suicide rates may decrease after 5 years. This is most likely due to a short follow-up period, with fewer patients followed beyond 5 years. Clinicians should be aware of symptoms of depression and suicidality beyond the initial years of their patient's cancer diagnosis (23) (see Table 3).

The higher suicide rates in the first year following a cancer diagnosis may partially explain absence of any significant decline in overall suicide rates in the more recent era (2007 onward), despite improvements in cancer treatment and patient survival. However, compared with the previous study (examining data from 1973 to 2002), overall suicide rates decreased by 25% after the year 2000 (7). This could be due to increased awareness about higher suicide rates among cancer patients, as well as improvements in cancer treatment and outcomes.

Nevertheless, the findings in the present study should be interpreted with caution due to misclassification bias (e.g., cause of death mistakenly labelled as "suicide") and lack of information on confounding factors, such as concomi-

TABLE 3. Suicide Rates in Cancer Patients According to Time Since Diagnosis

Latency	2000–2013 Number of Observed Suicides (%)	2000–2013 Standardized Mortality Ratio (95% CI)	2000–2007 Number of Observed Suicides (%)	2000–2007 Standardized Mortality Ratio (95% CI)	2007–2013 Number of Observed Suicides (%)	2007–2013 Standardized Mortality Ratio (95% CI)
0–11 Months	486 (33)	2.39* (2.2–2.6)	256 (26)	2.57* (2.3–2.9)	230 (43)	2.21* (1.9–2.5)
12–59 Months	636 (42)	1.22* (1.1–1.3)	368 (38)	1.17* (1.1–1.3)	268 (51)	1.28* (1.3–1.4)
60–119 Months	373 (25)	1.03 (0.9–1.2)	342 (36)	1.00 (0.9–1.1)	31 (6)	1.38 (0.9–2)

a *p<0.05.

tant psychiatric illnesses or substance abuse. The data based upon the population registry were also undoubtedly subject to drop out of patients during follow-up. However, the outcome measured in this study is mortality, which is accurately recorded by the SEER program for all the patients in the registry.

CONCLUSIONS

Overall, the suicide rate among cancer patients is slightly higher than the general U.S. population and has not changed significantly in more recent years. The emotional experience of cancer patients in the period immediately after cancer diagnosis deserves further study. Despite enormous gains in terms of cancer treatment and outcome, the suicide rates in patients with certain cancers remain high.

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