

Demographic and clinical factors associated with suicide in gastric cancer in the United States

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Abstract: While increased suicidal tendencies among cancer patients have been well documented, there has been no specific examination of suicide and gastric cancer. The purpose of this study is to characterize suicide incidence among patients diagnosed with gastric cancer from 1973 to 2013 and identify variables associated with higher suicide rates. Patients with gastric cancer were identified in the Surveillance, Epidemiology, and End Results (SEER) database of the National Cancer Institute. The study included clinical and demographic data from 1973 to 2013. Standardized mortality ratios (SMRs) and 95% confidence intervals (95% CIs) were calculated. Comparisons with the general US population were based on mortality data collected by the Centers for Disease Control and Prevention's National Center for Injury Prevention and Control using the Web-based Injury Statistics Query and Reporting System. Multivariable logistic regression models generated odds ratios (ORs) to assess factors associated with increased suicide in gastric malignancy. There were 210 suicides for patients with gastric cancer (SMR, 3.21; 95% CI: 2.80–3.67). Female gender (SMR 8.54), White race (SMR 4.08), age ≤ 39 years (SMR 3.06), and age 70–79 years (SMR 2.90), were found to be significant for an increased incidence of suicide compared with the general population. There was not a statistically significant relationship between suicide and marital status, income, mode of radiation therapy, and the role of surgical intervention. Approximately 77% of deaths by suicide occurred within the first year following diagnosis. Female gender, White race, age ≤ 39 years, and age 70–79 years are factors associated with increased risk of suicide in patients with gastric cancer. These results, coupled with further studies and analyses, will be used to formulate a comprehensive suicide risk factor scoring system for screening all cancer patients.

Keywords: Gastric cancer; suicide; Surveillance, Epidemiology, and End Results (SEER) Database; standardized mortality ratio (SMR); mortality

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Introduction

The incidence and mortality of gastric cancer have been declining in US and elsewhere over the past several decades; nonetheless, gastric cancer remains a major public health issue (1). In 1975, stomach cancer was the most common neoplasm worldwide (2). Today, it is the fifth most

common malignancy in the world and is the third leading cause of cancer related death worldwide (2). Stomach cancer is more common in less developed countries and is predominantly attributable to infection (3). Chronic infection with *Helicobacter pylori* is the strongest identified risk factor for stomach cancer of the pylorus and fundus, with about 90% of new cases of non-cardia gastric cancer

worldwide attributed to these bacteria (4). Gastric cancer in the proximal stomach often is associated with chronic gastroesophageal reflux disease (5).

In the 1930s, stomach cancer was the leading cause of cancer related death in the United States. Since this time, the death rate from this type of cancer has been trending downward. Similar decreasing trends have been noted in more recent years in areas with historically high rates, including several countries in Asia, Latin America and Europe (6). The observed decline may be linked to increased use of refrigeration for food storage, the use of antibiotics to treat infection with *H. pylori*, and the decreased intake of salted and smoked foods containing dietary nitrites (1,7). In more developed countries, decreases in smoking prevalence may also account for some of the decline (6). Although stomach cancer is declining overall, adenocarcinoma of the gastric cardia is increasing in North America and Europe, which is attributed to a rise in gastroesophageal reflux disease associated with obesity (1). The American Cancer Society estimates that in 2016, 26,370 cases of stomach cancer will be diagnosed in the United States and 10,730 people will die from this type of cancer (7). Adenocarcinomas of the esophagus and gastric cardia disproportionately affect white men, and the average age of diagnosis is 69 (7,8). The overall 5-year relative survival rate of all people with stomach cancer in the United States is about 29% (7). One reason the overall survival rate is poor in the United States is that most stomach cancers are diagnosed at an advanced stage (7).

As evidenced in the literature, cancer patients have an increased risk of suicide, especially during the first year after diagnosis (9). The incidence of suicide in someone with a cancer diagnosis is approximately double the incidence of suicide in the general population (10). The risk is higher for men, those with late locally advanced or metastasized cancer, older ages at diagnosis, lower level of education, non-married patients, folks in rural areas, and non-Hispanic whites (9-11). The risk is especially high with cancers such as lung, pancreas, or esophagus, where there is a low survival rate and the symptoms interfere with vital functions such as breathing and eating (12,13).

Suicide rates and risk factors for suicide have been analyzed in cancers of the genitourinary system, breast, pancreas, lung, head and neck, hematologic, and gynecologic malignancies. More limited work has been done to examine psychiatric factors associated with stomach cancer (14). While the risk of suicide in patients with gastric cancer has been documented as a part of larger analyses of primary cancers and their

suicide rates, there has not been a specific evaluation of suicide incidence and the associated demographic and clinical variables among patients with gastric malignancy (10,15,16). Identifying patients who may be at high risk of attempted and completed suicide is extremely important so that urgent clinical assessment, treatment, and prevention measures may be implemented. The aim of this study is to examine suicide incidence and associated factors in gastric cancer patients from 1973 to 2013 using the Surveillance, Epidemiology, and End Results (SEER) database.

Materials and methods

Data sources

The SEER database of the National Cancer Institute was queried to identify patients with gastric cancer. The SEER database consists of 18 tumor registries from different geographic regions in the United States, representing 28% of the US population.

Study population

The study cohort consists of patients from all 18 registries comprising the SEER database. Mortality, epidemiological, and demographic data from 1973 to 2013 from the SEER database was included. Comparison data with the United States population was derived from the Centers for Disease Control and Prevention's National Center for Injury Prevention and Control using the Web-based Injury Statistics Query and Reporting System (WISQARS).

Description of variables

Demographic variables of interest included age at the time of diagnosis (by decade), sex, race, marital status, and income. The primary outcome was suicide. Clinical variables included receipt of surgical intervention and mode of radiation therapy.

Statistical analysis

Standardized mortality ratios (SMRs) and their 95% confidence intervals (95% CIs) were calculated, and multivariable logistic regression models generated odds ratios (ORs) for the identification of factors associated with gastric malignancy. Statistical analysis was done using SAS (Cary, NC, USA) and figures were prepared with GraphPad

Table 1 Incidence of suicide among patients with gastric cancer by demographic characteristics

Cancer site	No. of suicides	Person-years	Suicide rate per 100,000		
			Person-years	SMR	95% CI
Stomach					
Population	210	344,134	61.02	3.21	2.80–3.67
Sex					
Female	25	146,332	0.119	8.54	5.65–12.42
Male	185	197,802	0.65	2.53	2.18–2.91
Age, years					
≤39	6	15,084	0.19	3.06	1.24–6.36
40–49	14	33,387	0.14	1.23	0.70–2.02
50–60	2	4,749	0.20	1.83	0.31–6.05
60–69	4	8,003	0.22	2.50	0.79–6.03
70–79	6	9,846	0.26	2.90	1.18–6.04
≥80	178	273,065	0.21	2.10	1.81–2.43
Race					
African American	6	42,502	0.1	0.59	0.24–1.22
White	174	236,917	0.51	4.08	3.51–4.72
Other	30	63,314	0.33	1.97	1.36–2.78
Unknown	0	1,400	0.00	–	–

SMR, standardized mortality ratio.

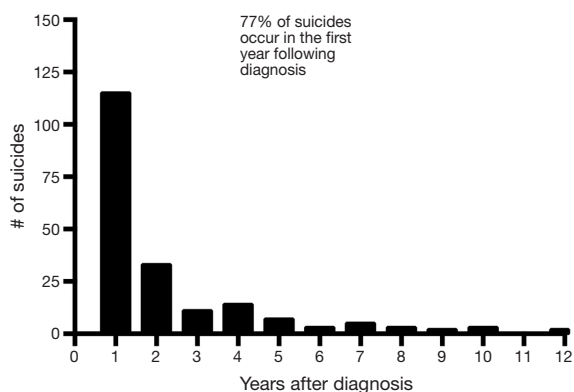


Figure 1 Suicide incidence compared with length of time after diagnosis.

Prism 6 (San Diego, CA, USA).

Results

There were 210 suicides for patients with gastric cancer

(SMR, 3.21; 95% CI: 2.80–3.67). Female gender (SMR 8.54), White race (SMR 4.08), age ≤39 years (SMR 3.06), and age 70–79 years (SMR 2.90), were found to be significant for an increased incidence of suicide compared with the general population (Table 1). Approximately 77% of deaths by suicide occurred within the first year following diagnosis (Figure 1).

Discussion

Previous studies have found that demographics such as male gender, white race, older age at diagnosis, and unmarried status are factors associated with a higher risk of suicide in cancer patients (9–11). To our knowledge, there has not been a specific evaluation of suicide incidence and the associated demographic and clinical variables among patients with gastric malignancy. Our study shows that patients with gastric cancer have a higher rate of suicide compared to the general U.S. population. We found that females with gastric cancer demonstrated approximately eight times the suicide

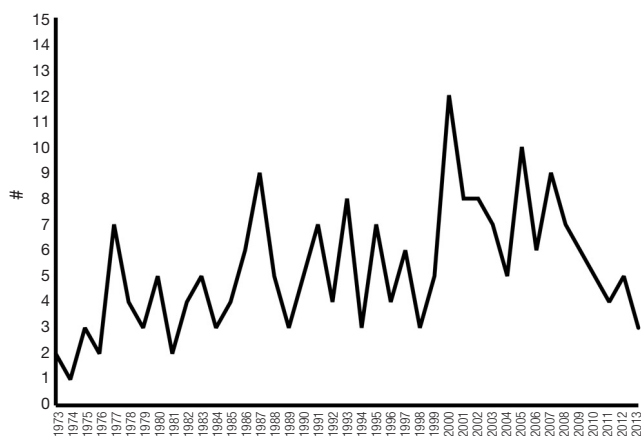


Figure 2 Suicides per year in patients with gastric cancer.

rate of the gender-matched population. Similar to previous studies, Whites with gastric cancer were more likely than other racial groups with gastric cancer to commit suicide, while African American race was found to be a protective factor for suicide. It has previously been reported that younger persons react with more distress and anxiety to the diagnosis of cancer (17). Not surprisingly, age ≤ 39 years was associated with the greatest increase in suicide risk in patients with gastric cancer in our study. There was not a statistically significant relationship between suicide and marital status, income, mode of radiation therapy, and the role of surgical intervention.

Approximately 77% of deaths by suicide occurred within the first year following diagnosis. This is consistent with the existing literature on cancer suicide, and may be attributable to the poor survival rate, advanced stage at diagnosis, and interference with vital functions (9,12,13). While previously there was an uptrend to 2000, suicide rates in patients with gastric cancer have declined during the past decade. The reasons for this pattern are unclear (Figure 2).

Limitations of our study include its retrospective nature, and the inability to examine incidence of psychiatric comorbidities such as anxiety and depression. Despite these limitations, our study is important because it shows that gastric cancer patients have a high risk of suicide compared to the general US population. We also characterized the risk factors associated with suicide in this cohort of patients. Our hope is that this information can be used in the future to target those patients who may be at high risk of suicide as early as possible and initiate appropriate interventions.

In conclusion, identification of evidence-based risk factors associated with suicide among patients with gastric

cancer is an important step in the development of screening strategies and management of psychosocial stressors. Given the vast majority of suicides in patients with gastric cancer occur within the first year of diagnosis, early identification and treatment of people at risk is paramount. Improved screening and risk factor stratification in these patients would almost certainly decrease overall incidence of suicide in gastric cancer patients. These results, coupled with further studies and analyses, will be used to formulate a comprehensive suicide risk factor scoring system for screening all cancer patients.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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