

Psychiatric comorbidities among cancer survivors in South Korea: A nationwide, population-based, longitudinal study

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Research article

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Abstract

Background: This longitudinal study aimed to analyze the incidence of mental disorders in cancer survivors using claims data in South Korea. **Methods:** We confirmed the presence of mental disorders in a nationwide cohort of 555,776 patients diagnosed with stomach, breast, colorectal, or prostate cancer between January 1, 2010 and December 31, 2016. We analyzed the incidence of mental disorders based on age and time of diagnosis. **Results:** Analysis of the data revealed 36,526 (6.5%) cancer survivors were diagnosed with a mental disorder 1 year prior to cancer diagnosis. Of these patients with mental disorders, 16,035 were diagnosed with anxiety (43.9%), 13,848 with depression (37.9%), 3,998 with stress reaction/adjustment disorders (10.9%), and 2,645 (7.2%) with substance abuse during their first visit. The incidence of depression was relatively high in the breast-cancer group and that of anxiety was high in the prostate-cancer group. The incidence of anxiety was high in females and that of substance abuse was high in males. Further, the incidence of depression was relatively high in the young age group and that of anxiety was high in the elderly group. The overall frequency of mental disorders peaked 2 months after cancer diagnosis. The highest rate of increase after diagnosis was noted among those with stress reaction/adjustment disorders. **Conclusion:** Mental disorders in cancer survivors showed different patterns of incidence depending on the nature of the disease, sex, age, and primary cancer. Considering individual factors, timely diagnosis and intervention for psychological distress may increase these patients' quality of life.

Introduction

In South Korea, the survival rate of cancer patients is rising, and the number of cancer survivors is increasing accordingly [1]. Currently, there are 1.7 million cancer survivors in the country, and these individuals face various emotional difficulties in addition to their physical problems [2].

During cancer treatment, distress is common due to the fear of death, tumor recurrence, and treatment-related side effects [3]. Psychiatric comorbidities are higher in cancer survivors than in the general population; these psychological problems can lead to poor adherence to treatment and may increase mortality among cancer survivors [4].

Information regarding mental disorders among cancer survivors in South Korea is limited because of the small sample sizes and cross-sectional designs of previous studies [5]. We aimed to investigate the incidence of mental disorders among cancer survivors with good prognoses (such as those with breast, prostate, stomach, or colorectal cancer) in South Korea using claims data [6].

Materials And Methods

The National Health Insurance (NHI) system is the public medical insurance system of South Korea; it covers almost 98% of the total population. The Health Insurance Review and Assessment Service (HIRA) generates data from reimbursement claims for healthcare services provided during hospital visits or

inpatient admissions. The data include general patient information, healthcare services, diagnoses, outpatient prescriptions, drug information, and provider information [7]. This study was approved by the institutional review board of Ajou University Hospital (IRB No. AJIRB-MED-EXP-17-101). The requirement for informed consent was waived by the board.

We used the nationwide cohort data of patients diagnosed with cancer between January 1, 2010 and December 31, 2016. Those diagnosed with any form of cancer between 2008 and 2009 were excluded. The patients who did not require oncology treatment for any type of cancer during the 2-year (washout) period starting in 2008 were considered cancer-free [8]. We included patients having cancer associated with good prognoses, such as breast (C50), stomach (C16), colorectal (C18-20), and prostate cancer (C61), classified according to the International Classification of Diseases (ICD) 10th Revision. Information on mental disorders was obtained from the HIRA database based on the primary diagnostic code. Diagnoses of mental disorders were identified using claims data from inpatient and outpatient first visits. We selected mental disorders such as anxiety (F40 – F41), depression (F32 – F33), stress reaction/adjustment disorders (F43), and substance abuse (F10 – F19), which, based on previous studies, are common in cancer survivors [9, 10].

We analyzed the incidence of mental disorders from 1 year before initial treatment and verified the patterns of the mental disorders according to time sequence. Descriptive statistics were used to estimate the frequency of mental disorders based on the diagnostic date of the mental disorder. We also analyzed characteristics of mental disorders by age, primary tumor, and disease. All statistical analyses were performed using R 3.0.2. (R Core Team, 2016, Vienna, Austria).

Results

In total, 559,779 cancer survivors were identified, and the median follow-up period was 22 months (range: 1.0–85.1 months). Among these survivors, 311,572 (55.7%) were men, and the median age at diagnosis was 62 years. A total of 36,526 (6.5%) cancer survivors developed a mental disorder. Anxiety was the most frequent mental disorder (16,035 cancer survivors, 43.9%) (Table 1), followed by depression (13,848 cancer survivors, 37.9%), stress (3,998 cancer survivors, 10.9%), and substance abuse (2,645 cancer survivors, 7.2%).

Table 1

The frequency of mental disorders in patients with cancer survivors (N = 559,776)

	Total	Stomach	Breast	Colon	Prostate
Patients	559,776	193,197	119,970	177,878	68,731
Sex					
Male	311,572	132,565	651	109,625	68,731
Female	248,204	60,632	119,319	68,253	
Age					
Median	62	64	50	64	69
Mental Disorder	36,526	12,166	8,810	10,619	4,931
Depression	13,848	4,388	3,773	3,834	1,853
Anxiety	16,035	5,309	3,361	4,935	2,430
Stress	3,998	1,091	1,507	1,036	364
Substance	2,645	1,378	169	814	284

Stomach cancer was detected in 193,197 patients, of which 12,166 (6.3%) were diagnosed with a mental disorder (Table 1). Anxiety was again the most frequent mental disorder, followed by depression, substance abuse, and stress. Colorectal cancer was identified in 177,878 patients, of which 10,619 (6.0%) were diagnosed with a mental disorder; similar findings were observed in these patients, that is, anxiety was the most frequent mental disorder, followed by depression, substance abuse, and stress. Breast cancer was identified in 119,970 patients, of which 651 were male. The median age was 50 years, the lowest among the four cancer types. In contrast to other diseases, depression was the most frequent mental disorder in breast cancer patients, and stress was more frequent than substance abuse. The overall emotional disease rate was also the highest (7.3%) among breast cancer survivors. Prostate cancer was identified in 68,731 patients, of which 4,931 (7.2%) were diagnosed with a mental disorder. In these patients, anxiety was the most frequent mental disorder, followed by depression.

Breast cancer survivors accounted for the highest proportion of depression cases (43%), and prostate cancer survivors accounted for the highest proportion of anxiety cases (49%) (Fig. 1). Stress was more common among breast cancer survivors, and substance abuse was more common among colorectal cancer survivors.

The overall pattern of diagnoses for mental disorders is shown in Fig. 2. The rate of mental disorders started to increase before diagnosis, peaked 2 months after the diagnosis, then decreased afterward. The

timing of peak incidences differed among the mental disorders. Depression peaked 2 months after cancer diagnosis, while anxiety peaked just before diagnosis. Substance abuse also peaked just before diagnosis. The highest rate of increase after treatment was noted for stress reaction/adjustment disorders. The peak in stress was large in breast cancer survivors, as well as in stomach cancer survivors. The peaks in depression and anxiety were similar, but there was a significant change in the peak in depression among breast cancer survivors before and after diagnosis. In those with colorectal cancer, substance abuse peaked before diagnosis.

Discussion

In this study, we investigated the incidence of mental disorders among cancer survivors and analyzed changes in the frequency of mental disorders starting 1 year before diagnosis using nationwide claims data. Among the 559,779 cancer survivors identified, 36,526 (6.5%) developed mental disorders. Mental disorders were identified in 6.3% of stomach cancer survivors, 6.0% of colon cancer survivors, 7.3% of breast cancer survivors, and 7.2% of prostate cancer survivors (Table 1). The highest incidence in breast cancer survivors is likely because this cancer occurs in women, who are also at high risk of emotional illness [10, 11].

Cancer survivors may experience significant distress due to fear of cancer diagnosis, treatment-related side effects, and recurrence or progression after treatment. Before diagnosis, distress may increase owing to tests being performed for a suspected malignancy and fear of radical treatment [12]. In this study, the incidence of mental disorders peaked within 2 months of cancer diagnosis, and then decreased gradually. Younger people had a higher rate of depression, and older people had a higher rate of anxiety. This has been confirmed in previous studies (Fig. 3) [13].

Each mental disorder showed a different time-dependent pattern of manifestation. Before diagnosis, the incidence of anxiety was the highest, which decreased after treatment. Depression was common after diagnosis, possibly due to treatment-related acute toxicity. The presence of depression during the post-treatment period may lead to non-compliance with adjuvant treatments [14]. Compared with other mental disorders, the frequency of stress reaction/adjustment disorders increased rapidly after diagnosis. In longitudinal studies of cancer survivors, stress reaction/adjustment disorders showed the highest rate of increase just after cancer diagnosis [11]. Therefore, providing personalized intervention based on the time-dependent pattern of each mental disorder may help improve cancer survivors' quality of life.

In this study, we identified differences in the emotional diseases associated with different cancer types (Fig. 1). Considering the frequency difference according to the cancer type, breast cancer survivors showed a relatively high frequency of depression and stress reaction/adjustment disorders. This may be due to the high proportion of women and young people. Anxiety was diagnosed in a high proportion of prostate cancer survivors, possibly because of the large proportion of elderly individuals and the high likelihood of accompanying chronic diseases such as hypertension and diabetes mellitus. The tendency of anxiety to increase with age was confirmed in this study as well as in previous studies [15]. Substance

abuse was diagnosed in a high proportion of colorectal and stomach cancer patients, possibly because these cancers are associated with alcohol intake [16]. Breast cancer showed the largest change in the frequency of affective-disorder diagnoses before and after the cancer diagnosis. This may be due to the higher proportion of women and the greater likelihood of a change in appearance after treatment compared with other cancer types. In a previous study of cancer survivors, women were more likely than men to report anxiety prior to treatment [17].

This study did have some limitations. First, mental disorders were identified based on claims data from the HIRA. The disease codes were based on claims data and were not formulated in a research setting. The ICD codes for mental disorders have lesser diagnostic accuracy than do those obtained from structured clinical data. However, in South Korea, the prescription of ant-psychotic drugs is highly regulated; thus, mental illness is diagnosed cautiously. This, in part, addresses the issue regarding the accuracy of the diagnosis codes. Second, we focused on time sequence and analyzed the patterns of incidence for the first mental-disorder diagnosis. As a cancer survivor may have several psychiatric comorbidities, future studies should consider changes in a patient's mental-health status over time.

In conclusion, many cancer survivors experience mental disorders before, during, or after treatment. The mental disorders we examined showed different patterns of incidence depending on the type of cancer, time sequence, and mental-disease subtype. Through peak time prediction of emotional disease diagnosis, timely diagnosis and early intervention essential for the management of mental disorders. For breast cancer survivors in particular, intensive preventive measures and clinical interventions are needed before and after cancer diagnosis.

Declarations

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Conflict of interest: The authors declare that they have no conflicts of interest.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (the institutional review board of Aiou University Hospital; AJIRB-MED-EXP-17-101) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Due to the retrospective nature of the study, the requirement for informed consent was waived by the board.

Availability of data and materials: The data used in the study are potentially identifiable and are not publicly available. The raw claims datasets generated and/or analyzed during the study are not publicly available due ethical restrictions by the HIRA.

Authors' contribution: All Authors took part in the design of the study, contributed to data collection, and participated in writing the manuscript.

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Figures

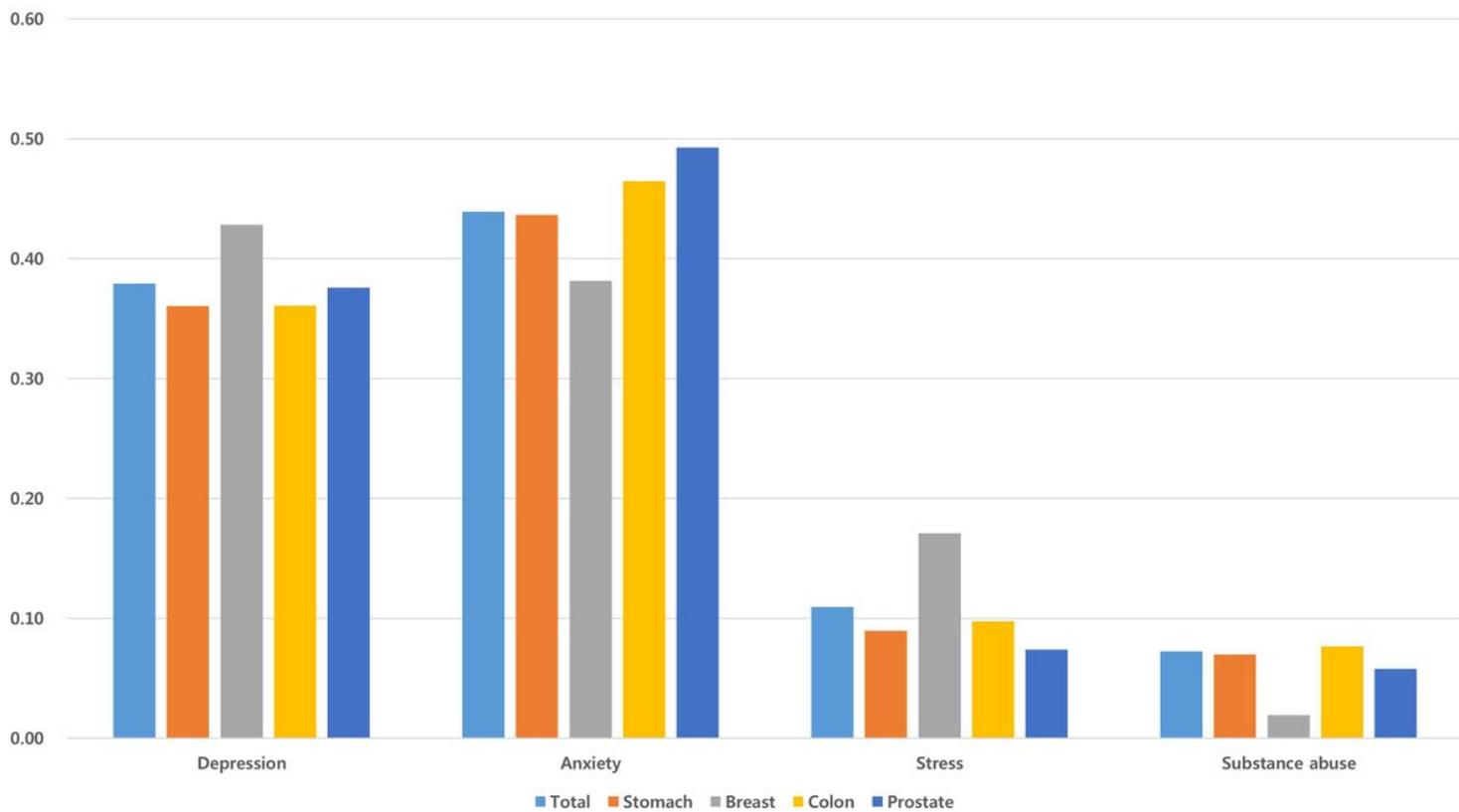


Figure 1

Distribution of mental disorders by cancer type

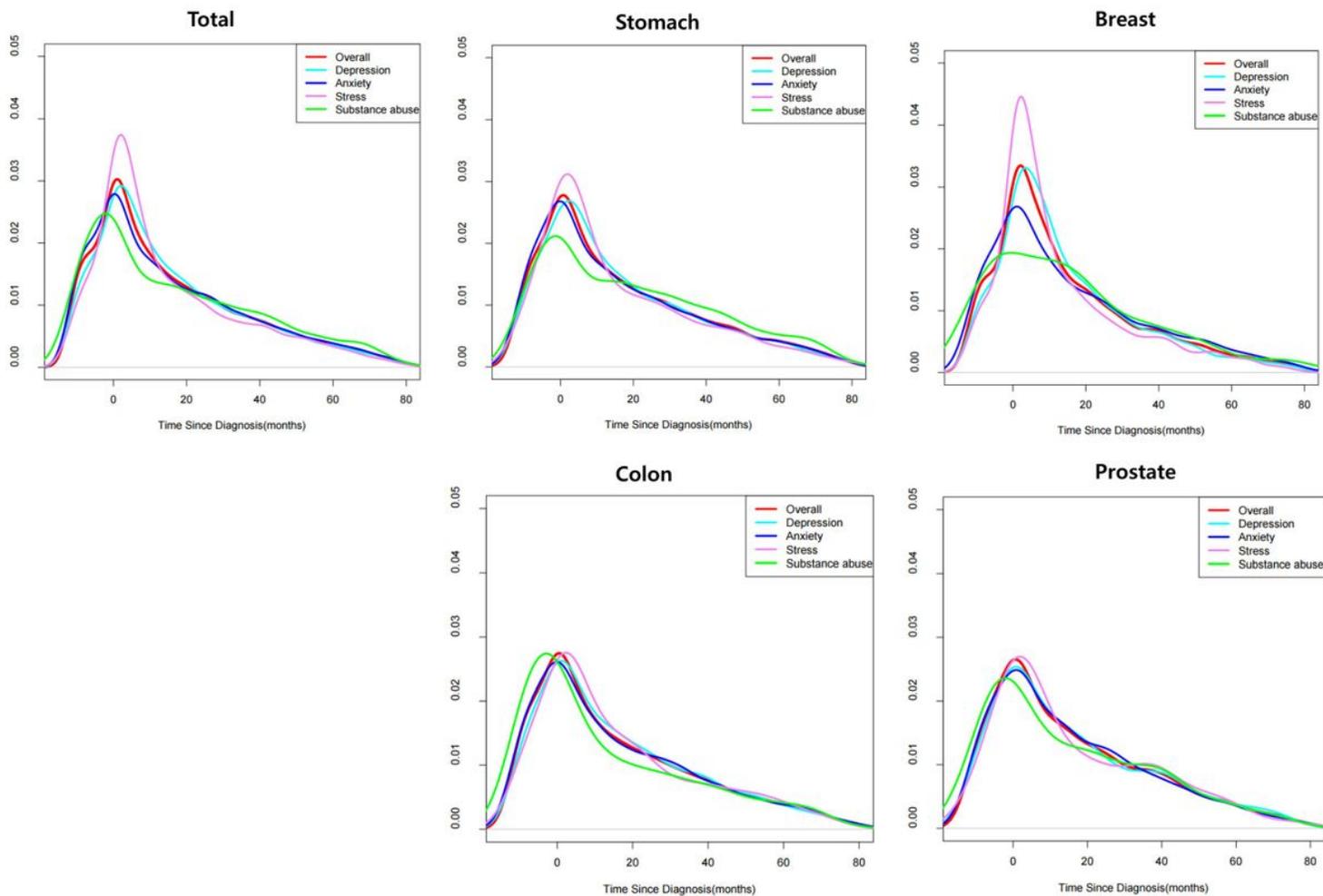


Figure 2

Frequency density of mental disorders according to the nature of the disease in cancer survivors

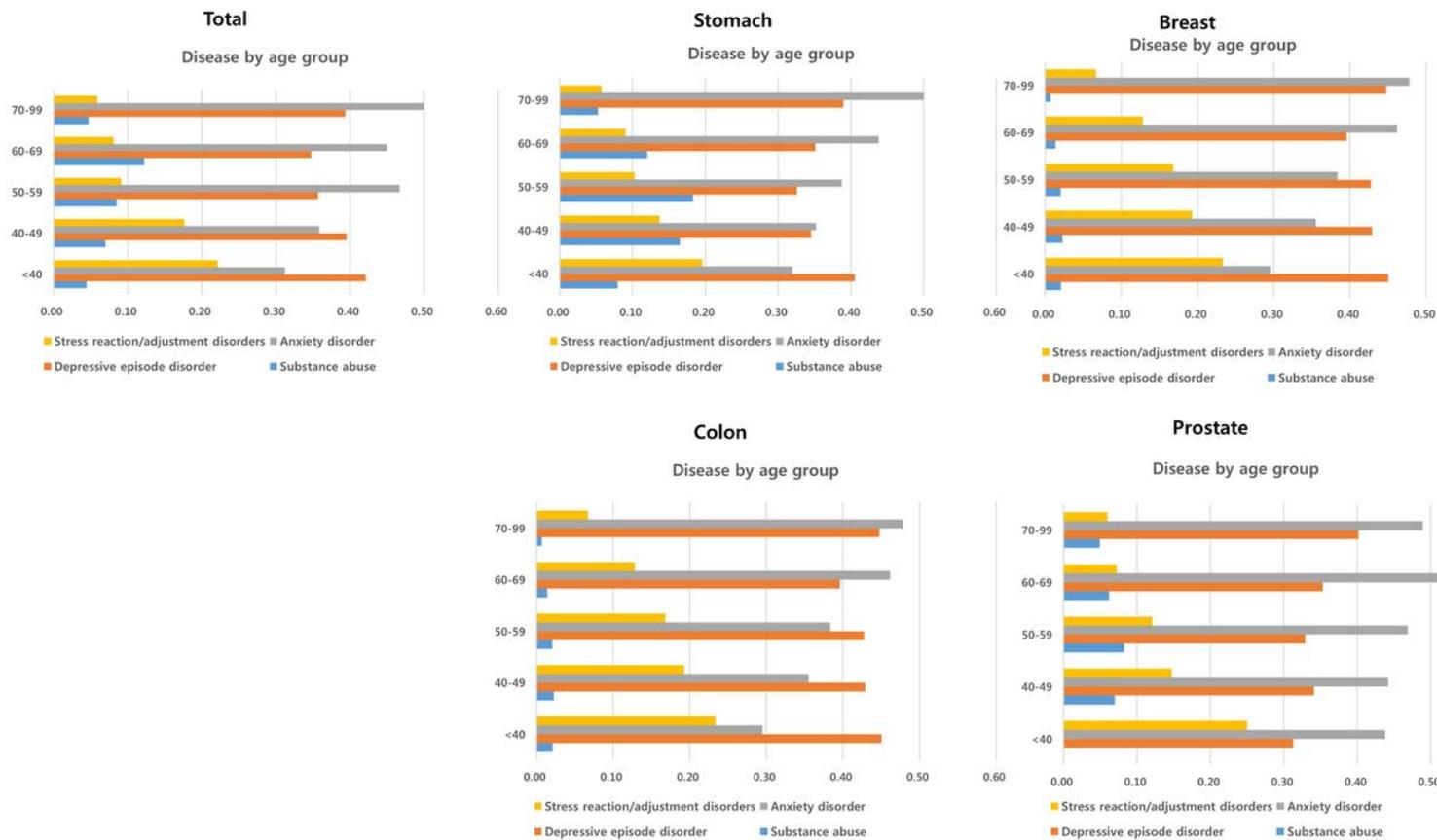


Figure 3

Distribution of mental disorders by age group