

## RESEARCH ARTICLE

# Depression and Suicide Ideas of Cancer Patients and Influencing Factors in South Korea

Su Jin Lee<sup>1</sup>, Jong Hyock Park<sup>1,2\*</sup>, Bo Young Park<sup>1</sup>, So Young Kim<sup>1</sup>, Il Hak Lee<sup>3</sup>, Jong Heun Kim<sup>1</sup>, Dai Ha Koh<sup>4</sup>, Chang-hoon Kim<sup>5</sup>, Jae Hyun Park<sup>6</sup>, Myong Sei Sohn<sup>3</sup>

### Abstract

**Background:** This study compared risk factors for depression and suicidal ideas among cancer patients for comparison with the general population, and identified influencing factors. **Materials and Methods:** We analyzed data from 2,472 cancer patients in the National Cancer Center and nine Regional Cancer Centers and frequency-matched data for age and sex from 2,349 members of the general population who completed the National Health and Nutrition Examination Survey in 2008. Logistic regression analysis was used to identify factors affecting depression and suicidal ideas. **Results:** Cancer patients were not likely to have more depression (OR=0.96, 95% CI=0.79-1.18) and were less likely to have suicidal ideas (OR=0.64, 95% CI=0.53-0.79) compared to the general population. Female sex, more stress, and lower quality of life were influencing factors. The additional risk factors for suicidal ideas among cancer patients included income (OR=0.62, 95% CI=0.43-0.91), smoking (OR=1.63, 95% CI=1.06-2.50), recurrence (OR=1.50, 95% CI=1.15-1.95), and chemotherapy (OR=1.66, 95% CI=1.26-2.19). **Conclusions:** No differences appeared in depression rates between cancer patients and the general population, and cancer patients were less likely to have suicidal ideas. However, cancer patients were likely to have more risk factors than the general population, and those classified as being at high risk of suicide should receive distress management and social economic support, from early in the treatment process.

**Keywords:** Cancer patients - depression - distress management - social economic support - suicidal ideas - Korea

*Asian Pac J Cancer Prev*, 15 (7), 2945-2950

### Introduction

According to the National Cancer Registry statistics released by the Korea Central Cancer Registry (KCCR) in 2008, the numbers of male and female cancer patients in Korea have risen by 61.5% and 97.5%, respectively, since 1999. Statistics also indicate that 700,000 living patients have been diagnosed with cancer, and the figure is expected to increase to 1.11 million by 2015 (Cancer Registration, Statistics Program, 2008).

With increased survival times, many cancer patients need to manage their diseases for the rest of their lives (National Cancer Institute, 2004). However, cancer patients reportedly find it difficult to continue a normal lifestyle due to depression and suicidal ideas (Zabora et al., 2001; Costanzo et al., 2007; Kamen et al., 2010; Maneeton et al., 2013). Accordingly, researchers worldwide have investigated the mental health of cancer patients (Akechi et al., 2002; Amir, 2002), and some have reported that patients with cancer or other negative prognoses are

highly likely to become depressed or commit suicide (Bjorkenstam et al., 2005; Fanger et al., 2010). However, other recent studies have found no significant differences in the prevalence of depression between cancer patients and the general population, suggesting that different approaches need to be taken in terms of suicide prevention management for cancer patients (Mitchell et al., 2011). In Korea, suicide reportedly ranks fifth (6.2%) among the causes of death (Shin et al., 2010), and cancer patients are twice as likely as the general population to commit suicide (Ahn et al., 2010). Although depression and suicidal ideation have been identified as the most important factors associated with the suicides of cancer patients (Akechi et al., 2002; Bruce et al., 2004), no in-depth research has focused on the risk factors associated with depression and suicidal ideation in cancer patients in Korea.

Therefore, this research was conducted to compare cancer patients' socioeconomic status, health-related behavior, depression and suicidal ideation, quality of life, and treatment methods with those of the general

<sup>1</sup>National Cancer Center in Korea, <sup>2</sup>College of Medicine, Chungbuk National University, Graduate School of Health Science Business Convergence, Chungbuk National University, Cheongju-si, <sup>3</sup>Graduate School of Public Health Yonsei University, <sup>4</sup>Preventive Medicine, Chonbuk National University, <sup>5</sup>Office of Public Health, Department of Cancer Management, Pusan National University Hospital, <sup>6</sup>Department of Social and Preventive Medicine, Sungkyunkwan University College of Medicine, Korea \*For correspondence: [jonghyock@gmail.com](mailto:jonghyock@gmail.com); [whitemiso@ncc.re.kr](mailto:whitemiso@ncc.re.kr)

population, with the goal of identifying additional factors that influence depression and suicidal ideation among cancer patients.

## Materials and Methods

### Participants

Subjects were recruited from patients at the National Cancer Center and nine Regional Cancer Centers in 2008. All subjects were 18 years or older and had been treated as outpatients or inpatients for 4 months or longer. Among the 2,661 patients who agreed to participate, we excluded those with missing data, for a total of 2,472 study subjects. The comparison group from the general population was selected from individuals who had participated in the 2008 National Health and Nutrition Examination Survey. Among the 9,744 possible participants, we excluded respondents younger than 18 years and those who had been diagnosed with cancer, and selected 2,349 individuals based on age distribution and sex pairings compatible with the cancer patient group.

### Measurements

We asked subjects whether they had been suffering from depression for 2 weeks or longer or had experienced thoughts of suicide during the previous year, and compared the answers with data for the general population, based on their responses to identical questions on the National Health and Nutrition Examination Survey. The study had a descriptive correlation design, and used a survey that assessed depression and suicidal ideation among cancer patients to allow an in-depth analysis of the significantly influential factors. Figure 1 presents the research model. Figure 1

### Variables

By comprehensively incorporating the significant factors identified in previous studies (Charlson et al., 1987; Miller, 2000; Pirkis, 2000; Akechi et al., 2002; Akechi et al., 2002; Amir., 2002; Bruce et al., 2004; Pirkola, 2004;

Bjorkenstam et al., 2005; Misono et al., 2008; Shin et al., 2008; Park et al., 2009; Ahn et al., 2010; Fanger et al., 2010; Kim et al., 2010; Recklitis et al., 2010; Shim, 2010; Shin et al., 2010; Mitchell et al., 2011), this study analyzed the influential parameters using depression and suicidal ideation as dependent variables, and sociodemographic characteristics, health-related behavior, clinical conditions, and quality of life as independent variables. Age, education, income (monthly income after cancer diagnosis), and marital status were categorized as sociodemographic characteristics, and smoking and alcohol consumption represented health-related behavior. In Model I, the Charlson Comorbidity Index was used to calibrate the effects of comorbid clinical conditions; the total comorbid condition score was categorized into three levels (0, 1, and 2) (Charlson et al., 1987), and the medians and interquartile ranges (IQRs) of the EQ5D scores, which indicate stress levels and quality of life, were assessed.

We established Model II for cancer patients only, by including clinical condition variables in addition to Model I. The additional factors included SEER stages (in situ/localized, regional, distant, and unknown/unstaged recurrence), and treatment methods such as surgery, chemotherapy, and radiotherapy.

### Statistical analysis

Compiled data were statistically analyzed using the Stata 10.0 program (Stata Corp., College Station, TX, USA). General comparisons were made between cancer patients and the general population, for those experiencing depression and suicidal ideation, using the  $\chi^2$  test. The Wilcoxon signed-rank test was used due to the skewed distribution of EQ5D. In the logistic regression analysis, the variables used for Model I cancer patients were identical to those used for the general population, but the variables used for Model II cancer patients included the clinical condition variables listed above. The level of significance was set at  $p < 0.05$ .

## Results

General characteristics of cancer patients and the general population and differences in depression and suicidal ideation

All of the variables-education, income, marital status, smoking, alcohol consumption, comorbid conditions,

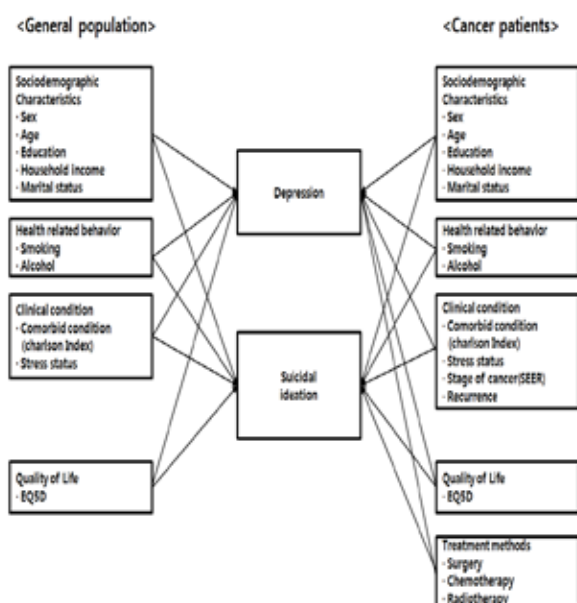


Figure 1. Research Model

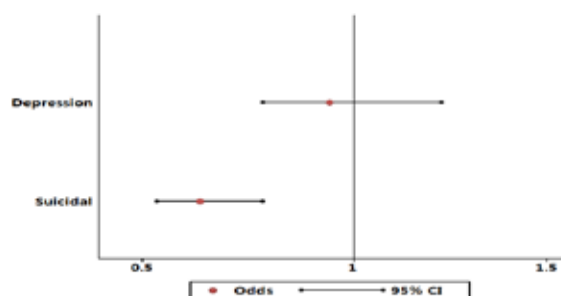


Figure 2. Odds Ratio and 95% Confidence Intervals of Depression and Suicidal Ideation. 1) Adjusted sex, age, education, household income, marital status, smoking, alcohol, comorbid condition, stress status and EQ5D)

Table 1. Comparison of Characteristics between Cancer Patients and the General Population

Characteristics	Cancer patients			Total			Depression			Suicidal		
	No.	%	$\chi^2$ (p value)	No.	%	$\chi^2$ (p value)	No.	%	$\chi^2$ (p value)	No.	%	$\chi^2$ (p value)
Total	2472	100.0		2349	100.0		487	100.0	6.7(0.010)	468	100.0	1.9(0.166)
Sex	1165	47.1	2.9(0.087)	1165	49.6		274	56.3	7.9(0.005)	246	52.6	5.9(0.015)
Age	598	24.2		602	25.6		133	27.3		114	24.4	
	1006	40.7		987	42.0		186	38.2		176	37.6	
	868	35.1	4.2(0.121)	760	32.4		168	34.5	3.3(0.193)	178	38.0	2.7(0.254)
Education	1288	52.1	10.5(0.001)	1333	56.8		240	49.3	27.9(<0.001)	223	47.7	27.9(<0.001)
	1184	47.9		1016	43.3		266	54.6		258	55.1	
	1230	49.8		774	33.0		151	31.0		146	30.3	
Household income (10 thousand won)	830	33.6	181.5(<0.001)	863	36.7		151	31.0	12.6(0.002)	148	30.7	21.8(<0.001)
	412	16.7		712	30.3		70	14.4		52	11.1	
	2056	83.2		1899	80.8		385	79.1		373	79.7	
Marital status	82	3.3	6.5(0.039)	72	3.1		23	4.7	15.4(<0.001)	20	4.3	15.7(<0.001)
	334	13.5	182.0(<0.001)	378	16.1		79	16.1	25.1(<0.001)	39	8.3	30.1(<0.001)
	182	7.4	1600.0(<0.001)	489	20.8		34	7.0	266.3(<0.001)	284	58.9	247.3(<0.001)
Smoking	278	11.3		1586	67.5		46	9.5		46	10.3	
Alcohol	1395	56.4		1430	60.9		263	54.0		246	52.6	
Comorbid condition (Charlson index)	463	18.7	143.3(<0.001)	633	27.0		85	17.5	20.8(<0.001)	73	15.6	39.9(<0.001)
	614	24.8		286	12.2		139	28.5		149	31.8	
	749	30.3		564	24.0		31	6.4		41	8.8	
	909	36.8		1210	51.5		133	27.3		138	29.5	
	814	32.9	106.9(<0.001)	575	24.5		323	66.3	13.9(0.001)	289	61.8	9.5(0.009)
	487	19.7	6.7(0.010)	395	16.8		291	59.8	0.1(0.820)	291	62.2	15.3(<0.001)
	468	18.9	1.9(0.166)	482	20.5		0.82	(0.23)	8.8(<0.001)	0.82	(0.23)	12.2(<0.001)
Stress status	0.91	(0.15)	27.7(<0.001)	0.95	(0.10)		0.82	(0.23)	25.7(<0.001)	60	(30)	26.7(<0.001)
Depression	70	(25)		80	(29)		171	35.1		164	35.0	
Suicidal Ideation	998	40.4		872	35.3		177	36.3		163	34.8	
EQ5D	872	35.3		455	18.4		113	23.2		116	24.8	
EuroQoL : VAS	147	6.0		482	19.5		26	26.0		25	5.3	
Stage of cancer(SEER)	1862	75.3		1583	64.0		360	73.9		340	72.7	
Recurrence	1583	64.0		187	38.4		357	76.3		357	76.3	
Surgery	771	31.2		187	38.4		141	30.1		141	30.1	
Chemotherapy							340	72.7		340	72.7	
Radiotherapy							357	76.3		357	76.3	
							179	38.3		179	38.3	

stress, depression, and quality of life-differed significantly between cancer patients and the general population ( $p<0.05$ ). Most cancer patients were in the initial in situ/localized stage (40.4%) according to SEER, and cancer had recurred in 482 of the patients (19.5%). In terms of general characteristics, similar results were obtained when the subjects were divided into depression and suicidal ideation groups ( $p<0.05$ ). However, no differences appeared in the risk of depression between cancer patients and the general population (OR=0.96, 95%CI=0.79-1.18), and cancer patients had less suicidal ideation (OR=0.64, 95%CI=0.53-0.79).

#### Factors affecting depression

Female cancer patients were at higher risk of depression than their male counterparts in Model I and the general population (OR=1.45, 95%CI=1.14-1.86, and OR=1.84, 95%CI=1.34-2.48, respectively). Stress was also significantly associated with depression in Model I cancer patients and the general population (OR=3.60, 95%CI=2.38-5.43 and OR=3.10, 95%CI=2.01-4.78 in those with mild stress, and OR=12.17, 95%CI=8.20-18.06 and OR=10.76, 95%CI=6.96-16.64 in those with moderate to severe stress, compared to those without stress, respectively). A 0.1-unit increase in EQ5D scores (reflecting quality of life) decreased the risk of depression in cancer patients and the general population (OR=0.65, 95%CI=0.04-0.12 and OR=0.16, 95%CI=0.07-0.39, respectively), indicating that a perception of a higher quality of life decreased the risk of depression. For the general population, the OR for being widowed, divorced or separated was 1.40 (95%CI=1.03-1.92); otherwise, in the cancer patient group, marital status did not result in increased risk of depression. In Model II, which included the clinical condition

**Table 2. Adjusted Odds Ratios and 95% Confidence Intervals of Factors Affecting Depression from Logistic Regression in Cancer Patients and the General Population**

Characteristics		Cancer patients				General population	
		Model I		Model II		Model I	
		OR	95% CI	OR	95% CI	OR	95% CI
Sex	Women	1.45	(1.14-1.86)	1.39	(1.08-1.79)	1.84	(1.34-2.48)
Age	under 50	1		1		1	
	50-64	0.84	(0.64-1.11)	0.85	(0.64-1.13)	1.02	(0.71-1.46)
	65 and over	0.92	(0.69-1.23)	0.90	(0.68-1.21)	1.00	(0.64-1.54)
Education	Under middle school	1		1		1	
	highschool and over	1.27	(0.99-1.62)	1.22	(0.96-1.56)	0.75	(0.55-1.03)
Household income (10 thousand won)	under 100	1		1		1	
	100-299	0.80	(0.61-1.05)	0.82	(0.62-1.07)	0.87	(0.64-1.18)
	300 and over	0.80	(0.57-1.15)	0.82	(0.58-1.17)	0.71	(0.50-1.02)
Marital status	Married	1		1		1	
	Single	1.48	(0.85-2.58)	1.48	(0.86-2.60)	0.94	(0.46-1.92)
	Widowed, divorced, separated	1.07	(0.77-1.48)	1.09	(0.78-1.51)	1.40	(1.03-1.92)
Smoking	Yes	1.33	(0.85-2.09)	1.44	(0.91-2.27)	1.10	(0.78-1.55)
Alcohol	Yes	0.97	(0.66-1.43)	1.09	(0.74-1.60)	1.01	(0.78-1.32)
Comorbid condition (Charlson index)	None 0	1		1		1	
	Mild 1	1.10	(0.81-1.48)	1.14	(0.84-1.54)	1.08	(0.81-1.43)
	Moderate + (2+)	1.06	(0.81-1.40)	0.76	(0.45-1.25)	1.43	(0.99-2.08)
Stress status	None	1		1		1	
	Mild	3.60	(2.38-5.43)	3.53	(2.33-5.34)	3.10	(2.01-4.78)
	Moderate +	12.17	(8.20-18.06)	12.19	(8.20-18.12)	10.76	(6.96-16.64)
EQ5D	unit: 0.1	0.65	(0.04-0.12)	0.76	(0.04-0.14)	0.16	(0.07-0.39)
Stage of cancer (SEER)	in situ/localized			1			
	Regional			1.04	(0.80-1.36)		
	Distant			1.64	(0.93-2.91)		
	Unknown or Unstage			0.99	(0.59-1.66)		
Recurrence	Yes			1.16	(0.89-1.52)		
Surgery	Yes			1.11	(0.83-1.47)		
Chemotherapy	Yes			1.25	(0.95-1.63)		
Radiotherapy	Yes			1.21	(0.95-1.53)		
Pseudo R2	R2	0.183		0.188		0.160	
Hosmer-Lemeshow test	p value	0.0609		0.5682		0.004	

**Table 3. Adjusted Odds Ratios and 95% Confidence Intervals of Factors Affecting Suicidal Ideation from Logistic Regression in Cancer Patients and the General Population**

Characteristics		Cancer patients				General population	
		Model I		Model II		Model I	
		OR	95% CI	OR	95% CI	OR	95% CI
Sex	Women	1.27	(1.00-1.63)	1.22	(0.95-1.57)	1.44	(1.08-1.90)
Age	under 50	1		1		1	
	50-64	1.00	(0.75-1.33)	1.00	(0.75-1.33)	1.04	(0.74-1.47)
	65 and over	1.24	(0.92-1.66)	1.20	(0.90-1.62)	1.22	(0.81-1.85)
Education	Under middle school	1		1		1	
	highschool and over	1.19	(0.94-1.52)	1.13	(0.88-1.44)	0.77	(0.57-1.03)
Household income (10 thousand won)	under 100	1		1		1	
	100-299	0.96	(0.74-1.24)	1.01	(0.78-1.32)	0.78	(0.58-1.05)
	300 and over	0.62	(0.43-0.91)	0.64	(0.44-0.93)	0.77	(0.55-1.08)
Marital status	Married	1		1		1	
	Single	1.24	(0.70-2.18)	1.21	(0.68-2.15)	1.45	(0.77-2.73)
	Widowed, divorced, separated	1.08	(0.78-1.50)	1.07	(0.77-1.49)	1.48	(1.09-2.01)
Smoking	Yes	1.63	(1.06-2.50)	1.78	(1.15-2.74)	1.31	(0.96-1.78)
Alcohol	Yes	1.10	(0.76-1.60)	1.30	(0.90-1.90)	0.83	(0.65-1.07)
Comorbid condition (Charlson index)	None 0	1		1		1	
	Mild 1	0.92	(0.67-1.25)	0.98	(0.71-1.34)	0.87	(0.66-1.14)
	Moderate + (2+)	1.25	(0.96-1.63)	1.19	(0.74-1.90)	0.85	(0.59-1.22)
Stress status	None	1		1		1	
	Mild	2.90	(2.10-4.23)	2.83	(1.94-4.13)	2.29	(1.60-3.27)
	Moderate +	7.69	(5.37-11.02)	7.58	(5.28-10.88)	8.12	(5.63-11.71)
EQ5D	unit: 0.1	0.55	(0.03-0.10)	0.07	(0.04-0.13)	0.02	(0.01-0.05)
Stage of cancer (SEER)	in situ/localized			1			
	Regional			0.91	(0.70-1.20)		
	Distant			0.98	(0.58-1.68)		
	Unknown or Unstage			0.91	(0.54-1.53)		
Recurrence	Yes			1.50	(1.15-1.95)		
Surgery	Yes			1.07	(0.81-1.42)		
Chemotherapy	Yes			1.66	(1.26-2.19)		
Radiotherapy	Yes			1.17	(0.92-1.49)		
Pseudo R2	R2	0.157		0.170		0.182	
Hosmer-Lemeshow test	p value	0.192		0.152		0.021	

variables for cancer patients, the significant factors associated with depression were same as those observed in Model I for cancer patients, and no significant associations appeared for clinical condition factors.

Table 2

#### *Factors affecting suicidal ideation*

Being female and having a higher level of stress were associated with suicidal ideation in Model I cancer patients and the general population. Higher EQ5D scores were associated with less suicidal ideation, indicating that a perception of a higher quality of life may decrease the risk of experiencing thoughts of suicide. Among cancer patients, higher income was associated with less suicidal ideation (OR=0.62, 95%CI=0.43-0.91, for those with household income  $\geq$ 300,000 won compared to <100,000 won) and smokers had higher levels of suicidal ideation (OR=1.63, 95%CI=1.06-2.50). Among the general population these associations were not significant, but being widowed, divorced, or separated was significantly associated with suicidal ideation. In Model II (which included the clinical condition variables for cancer patients), factors significantly associated with suicidal ideation were the same as those in Model I in cancer patients, but sex and clinical factors such as recurrence and receiving chemotherapy were also significant (OR=1.50, 95%CI=1.15-1.95 and OR=1.66, 95%CI=1.26-2.19, respectively).

## **Discussion**

This study compared risk factors for depression and suicidal ideation among cancer patients and the general population, and identified additional risk factors that are not found in the general population. It is important to focus on distress and suicidal risk among cancer patients who suffer from the financial, physical, and mental burden caused by lengthy and expensive treatments and fear of recurrence.

Previous studies have suggested that cancer patients have a higher prevalence of depression and suicidal ideation, and that depression and suicidal ideation increase the risk of committing suicide. However, our study results did not reveal a significant difference in the risk of depression between cancer patients and the general population, and cancer patients were less likely to experience suicidal ideation. One meta-analysis has suggested that, although many years of research have focused on depression in patients with cancer, a combination of mood disorders is more prevalent and depression and anxiety are less common than previously thought (Mitchell et al., 2011). Therefore, mental health problems might manifest as other disorders such as less frequently measured mood disorders or adjustment disorders, rather than depression or suicidal ideation.

Our findings indicate that, similar to previous studies (Miller, 2000; Pirkis, 2000; Akechi et al., 2002; Akechi et al., 2002; Amir, 2002; Park et al., 2009; Ahn et al., 2010; Recklitis et al., 2010; Kim et al., 2010; Mitchell et al., 2011), female sex, more stress, and lower perceived quality of life were more likely to cause depression and

suicidal ideation. The additional risk factors for suicidal ideation among cancer patients included income, smoking, recurrence, and chemotherapy.

Unlike the general population, cancer patients were affected by factors such as smoking and recurrence. Smoking is a major factor behind suicidal ideation, and research has demonstrated that the risk of suicide increases when a smoker is stricken with a malignant disease (Miller, 2000; Park et al., 2009). Therefore, it can be inferred that smoking can become a greater risk factor for suicidal ideation in cancer patients than in the general population. Furthermore, unlike other diseases for which progress can be predicted, cancer involves unpredictable and stressful situations, such as metastasis, recurrence, and ineffective treatment (Kim, 2010). Fear of recurrence can cause intense anxiety and stress in cancer patients, which is believed to be a risk factor associated with suicidal ideation. Additionally, our results indicate that cancer patients are greatly affected by chemotherapy, which can be interpreted in terms of adverse physical consequences such as changes in appearance, which can influence suicidal ideations (Louhivuori, 1979). Therefore, cancer patients face additional risk factors for depression and suicidal ideation that do not apply to the general population. However, a previous study reported conflicting results about the risk of suicide (Recklitis et al., 2010), so additional research and analyses are required.

The present study was not able to confirm how age and education affected depression and suicidal ideation among cancer patients. However, previous research has revealed that depression and suicide rates are higher among elderly citizens (Misono et al., 2008), and that a low level of education is associated with depression and suicide ideation (Ahn et al., 2010; Recklitis et al., 2010). In the present study, the results may have been affected by the fact that more than 50% of participants were aged  $\geq$ 50 years, and more than 50% had less than a middle-school level of education, so the socioeconomic differences might not be significant. The SEER stage (used to categorize localized primary cancer and metastasized cancer), and the Charlson Comorbidity Index (used to assess the effects of comorbid conditions) revealed no significant differences in depression and suicidal ideation; this differs from the results of previous studies (Recklitis et al., 2010; Shin et al., 2008). The difference might have been related to the fact that we could not stratify the patients by type of cancer because the number of patients with each type of cancer was so small, and previous studies might have focused on specific types of cancer.

Another limitation of this study is that the results may not represent the entire cancer patient population of Korea, because we used a convenience sampling method among the patients at the National Cancer Center and nine Regional Cancer Centers rather than a probability sampling method for the entire country. Nonetheless, our survey was conducted at Regional Cancer Centers located throughout Korea, and we minimized sampling selection bias by taking account of the cancer occurrence rate in Korea and by securing representation for each type of cancer.

Frequency matching was performed for the cancer

patients and participants from the general population, based on their age (expressed in 10-year ranges) and sex distribution; this could be criticized for a lack of homogeneity between the two groups. Although clinical diagnosis would be the most accurate and reliable means for assessing depression and suicidal ideation, this study used the same questionnaire as the National Health and Nutrition Examination Survey, to ensure accurate comparison of the results for cancer patients and the general population. A number of studies, including one conducted by Choi (2011), have analyzed the results of the National Health and Nutrition Examination Survey, specifically the items related to depression and suicidal ideation. We tried to use the same items so that our results could be readily compared with previous research.

We measured only depression and suicidal ideation among cancer patients. Other mental health problems also occur among cancer patients, such as adjustment disorder and mood disorder, so this study might have been limited by focusing on depression and suicidal ideation.

Despite these limitations, we believe that the results are significant, and highlight the need to take diverse approaches to prevent suicide among cancer patients. In conclusion, although suicidal ideation levels were lower among cancer patients than the general population, we identified additional risk factors for cancer patients, such as income, smoking, recurrence, and chemotherapy. It is important to monitor all mental health problems closely, not only depression and suicidal ideation. Active intervention is required, and means of psychosocial support need to be developed and implemented for effective suicide prevention.

## Acknowledgements

This study was supported by National Cancer Center in Korea (0910191, 1210151).

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