

## RESEARCH ARTICLE

# Factors Affecting the Quality of Life of Korean Cancer Survivors Who Return to the Workplace

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### Abstract

**Background:** Although the prevalence of cancer is increasing, it is no longer synonymous with death. The number of cancer survivors is estimated to be increasing due to development in medical treatments and social programs; cancer survivors are increasingly returning to work after long-term unemployment. Thus, we examined the quality of life (QOL) and the factors associated with return of cancer survivors to the workplace. **Materials and Methods:** This study was performed using the 2008 Community Health Survey administered by the Korea Centers for Disease Control and Prevention (N= 548). We used Chi-square tests to compare demographic variables based on self-perceived health status, and analysis of variance (ANOVA) to compare QOL scores among groups. We also performed a mixed-model analysis of the relationship between QOL and factors at the workplaces of cancer survivors. **Results:** Based on the results of our study, the overall QOL of cancer survivors was associated with 'mutual respect', 'free emotional expression', occupation, and age. Moreover, different trends of QOL according to self-perceived health were identified on additional analysis. In the 'bad' self-perceived health group, QOL was significantly different according to income. The QOL of cancer survivors in the low-income group was lower than in the other groups. Conversely, the 'normal' group had a lower QOL caused by 'no mutual respect' and "no free emotional expression" in the workplace. The QOL in the 'good' group based on self-perceived health was higher in the younger age group. **Conclusions:** There may be a significant relationship between QOL and workplace factors for cancer survivors, although further study is needed to investigate this relationship in detail. This may facilitate formulation of policy and efforts to prevent and manage the decline in the QOL of cancer survivors returning to work.

**Keywords:** Cancer survivors - job status - EQ-VAS - quality of life - Korea

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### Introduction

In the early 1990s, the majority of cancer patients did not survive and the onset of cancer was considered a death sentence (Benowitz, 1999; Austin et al., 2002; Moser et al., 2013). Simultaneously, the number of cancer patients gradually increased due to the aging population, which prompted many studies of the prevention and treatment of cancer (Niu et al., 2014).

Currently, cancer is the primary cause of death, as indicated by the proportion of cancer-related deaths among total deaths (21.0% in 1995, 23.8% in 2000, 28.6% in 2010; (Statistics Korea, 1993-2012). However, the perception of cancer has changed; it is no longer associated with death (Zeichner et al., 2014) and is often considered a chronic disease because cancer survival rates have increased dramatically (5-year relative survival rates were 41.2% from 1993-1995 and 66.3% from 2007-2011; (The Korea Central Cancer Registry, 1993-2011). Nevertheless,

the prevalence of cancer continues to increase (169,365 people in 1993-1995, 886,253 in 2007-2011; (The Korea Central Cancer Registry, 1993-2011); consequently, the number of cancer survivors is predicted to also increase.

The management of cancer survivors is gaining more attention and numerous studies have been conducted on the subject. In previous studies, the factors affecting the quality of life (QOL) of cancer survivors were analyzed. In those studies, the QOL of cancer survivors was affected by treatment, socioeconomic status, demographic status, social support, family support, and spousal role, among others. Additionally, the majority of previous studies examined specific cancer survivors (Dorval et al., 1998; Gotay and Muraoka, 1998; Stewart et al., 2001; Bottomley, 2002; Hewitt et al., 2003; Parker et al., 2003; Langeveld et al., 2004; Wenzel et al., 2005; Bradley et al., 2006; Pourhoseingholi et al., 2008; Sanda et al., 2008; Ashing-Giwa and Lim, 2009; Mohammadi et al., 2013a, 2013b; Zainal et al., 2013; Niu et al., 2014; Yan et al., 2014).

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In contrast, we focused on the QOL of cancer survivors who returned to work. A number of cancer patients lose their jobs due to their disease (Hewitt et al., 2005; Short et al., 2005; Mehnert, 2011; de Boer et al., 2009). However, the number of cancer survivors returning to work has gradually increased due to development of medical treatments and social programs (Bouknight et al., 2006; Kennedy et al., 2007). Cancer survivors' occupations are not only a source of revenue but also represent a return to a normal life (Peteet, 2000; Rasmussen and Elverdam, 2008). Thus, returning to the workplace can have a positive effect on the physical and mental health of cancer survivors.

Conversely, many studies have been published regarding the difficulties experienced by cancer survivors returning to the workplace, including factors such as physical and mental changes after cancer, interpersonal relationships, and discrimination at the workplace (Greaves-Otte et al., 1992; Hoffman, 2005; Short et al., 2005; Taskila and Lindbohm, 2007; Mehnert, 2011).

Although several studies of the QOL of cancer survivors have been conducted, specific data concerning cancer survivors who returned to work were lacking. Thus, in this study, we examined cancer survivors' QOL and the associated factors at the workplace. Additionally, we conducted a subgroup analysis according to self-perceived health status.

## Materials and Methods

### Study population

The data used in this study were obtained from the Community Health Survey (2008) administered by the Korea Centers for Disease Control and Prevention, which was designed to facilitate interprovincial comparisons. The Community Health Survey was administered by investigators who conducted one-on-one visits and interviews targeting adults 19 years of age or older in 253 health centers nationwide starting in 2008.

The final analysis included data from 548 cancer survivors who were employed, excluding cancer survivors whose QOL and/or each self-perceived health variable information was incomplete and therefore could not be analyzed. In our study, a cancer survivor was defined as an individual who survived for more than 5 years after the onset of cancer. The Community Health Survey protocol was reviewed and approved by the Institutional Review Board of the Korea Centers for Disease Control and Prevention (2010-02-CON-22-P).

### Variables

The outcome variables were evaluated using the EuroQOL visual analog scale (EQ-VAS). EQ-VAS is a self-rated health questionnaire presented as a vertical visual analog scale, where the endpoints are labeled 'best

**Table 1. Characteristics of cancer survivors (N, %)**

	N	Self-perceived health				p-value	
		Bad %	Normal %	Good %			
Mutual respect in the workplace							
Yes	229	81.5	165	87.8	66	83.5	0.1923
No	52	18.5	23	12.2	13	16.5	
Free emotional expression in the workplace							
Yes	198	70.5	130	69.1	58	73.4	0.7839
No	83	29.5	58	30.9	21	26.6	
Occupation							
Managers and professionals	10	3.6	16	8.5	9	11.4	< 0.0001
Clerks	8	2.8	6	3.2	7	8.9	
Service and sales workers	42	14.9	30	16.0	10	12.7	
Skilled agricultural, forestry and fishery workers	177	63.0	86	45.7	31	39.2	
Trade workers and elementary occupations	44	15.7	50	26.6	22	27.8	
Family income							
Q4	49	17.4	45	23.9	23	29.1	0.0032
Q3	69	24.6	58	30.9	27	34.2	
Q2	72	25.6	49	26.1	17	21.5	
Q1	91	32.4	36	19.1	12	15.2	
Gender							
Male	126	44.8	87	46.3	48	60.8	0.0393
Female	155	55.2	101	53.7	31	39.2	
Age (Years)							
<44	8	2.8	11	5.9	7	8.9	0.0482
45 - 64	122	43.4	100	53.2	40	50.6	
65 - 74	117	41.6	59	31.4	25	31.6	
>75	34	12.1	18	9.6	7	8.9	
Educational level							
Less than high school	235	83.6	127	67.6	47	59.5	< 0.0001
High school education	41	14.6	49	26.1	19	24.1	
College graduate	5	1.8	12	6.4	13	16.5	
Total	281	51.3	188	34.3	79	14.4	

\*p-values by  $\chi^2$  tests for categorical variables

imaginable health state' and 'worst imaginable health state.' Participants completed the questionnaire on the study day. Scores ranged from 0 to 100, and the responses were used as a quantitative measure of participants' self-rated health.

The variables of interest associated with the outcome variables were 'mutual respect in the workplace' and 'free emotional expression in the workplace.' 'Mutual respect in the workplace' was defined as a subjective feeling regarding mutual respect and confidence in interpersonal relationships at the workplace. 'Free emotional expression in the workplace' was defined as the ability to express individual emotions at the workplace.

Other independent variables considered in the analysis were occupation type, family income, gender, age, and educational level. Occupations were divided into managers and professionals, clerks, service and sales workers, skilled agricultural, forestry and fishery workers, trade workers and elementary occupations. Age was classified into less than 44 years, 45-64 years, 65-74 years and over 74 years. Family income was classified into four groups and educational levels were classified as less than high school, high school education, and college graduate. Additionally, the self-perceived health variables used in the subgroup analysis to describe the health status were 'good', 'normal' or 'bad.'

### Statistical analyses

We first examined the distribution of each variable to analyze the general characteristics according to self-perceived health and performed  $\chi^2$  tests to assess differences in each variable. Next, to compare the average EQ-VAS score according to the independent variables, we performed analyses of variance (ANOVAs). A mixed-model analysis was used to examine the associations between factors at the workplace and QOL among cancer survivor workers, while controlling for potential confounding variables such as occupation, family income, gender, age, and educational level. Additionally, we performed a subgroup analysis based on self-perceived health status. All analyses were performed using the SAS software (version 9.2) and p-values < 0.05 were considered to indicate statistical significance.

## Results

Regarding self-perceived health status, of the 548 study participants, 281 were 'bad', 188 were 'normal' and 79 were 'good.' The most common response to 'mutual respect in the workplace' was responded 'yes.' Regarding the 'free emotional expression in the workplace' factor, the response 'yes' was more frequent than 'no.' In terms of type of occupation, skilled agricultural and forestry

**Table 2. QOL Relationship with Demographic Characteristics and the Workplace Environment [Mean (Standard Deviation, SD) and p-values\*]**

	Self-perceived health								
	Mean	Bad SD	p-value	Mean	Normal SD	p-value	Mean	Good SD	p-value
Mutual respect in the workplace									
Yes	61.5	16.8	0.3116	71.3	12.5	0.0029	81.7	13.8	0.7905
No	62.5	16.3		61.3	20.1		79.5	15.9	
Free emotional expression in the workplace									
Yes	62.4	16.5	0.0233	70.0	15.0	0.3409	80.9	14.3	0.9169
No	60.0	17.1		70.2	11.5		82.5	13.7	
Occupation									
Managers and professionals	62.0	14.0	0.7717	76.6	8.3	0.019	84.4	7.7	0.861
Clerks	63.8	13.0		60.0	30.5		81.4	10.7	
Service and sales workers	63.4	14.6		73.4	13.4		83.5	15.5	
Skilled agricultural, forestry and fishery workers	60.7	17.2		67.1	12.9		79.7	14.9	
Trade workers and elementary occupations	63.6	17.7		72.2	13.6		81.3	15.7	
Family income									
Q4	68.2	13.8	0.1611	72.3	16.1	0.9083	79.8	14.9	0.3369
Q3	61.7	15.8		70.5	12.3		82.2	15.6	
Q2	59.8	16.0		70.1	14.2		79.1	13.3	
Q1	59.7	18.6		66.6	13.3		85.3	9.7	
Gender									
Male	62.6	17.2	0.2705	70.4	14.1	0.2747	82.8	12.2	0.1098
Female	61.0	16.3		69.8	14.0		79.0	16.4	
Age (Years)									
<44	62.5	12.8	0.4751	70.5	16.2	0.4687	85.0	11.9	0.3978
45 - 64	63.6	16.1		71.9	14.0		81.2	13.3	
65 - 74	60.7	16.9		67.7	13.5		82.7	13.9	
>75	58.2	18.5		67.1	14.0		73.6	20.1	
Educational level									
Less than high school	60.7	17.0	0.5597	69.7	13.5	0.4589	82.0	13.2	0.8509
High school education	66.8	14.2		70.2	16.0		79.1	18.0	
College graduate	64.0	16.7		73.3	10.1		82.2	11.0	
Total	61.7	16.7		70.1	14.0		81.3	14.0	

\*EQ-VAS, EuroQOL visual analog scale; QOL, quality of life; \*p-values by analysis of variance (ANOVA)

**Table 3. Mixed-Model Analysis Results of EQ-VAS (Estimated Regression Coefficient, p-value\*)**

	EQ-VAS	
Mutual respect in the workplace		
Yes	-	-
No	-3.418	0.0499
Free emotional expression in the workplace		
Yes	-	-
No	-3.622	0.0101
Occupation		
Managers and professionals	0.798	0.7442
Clerks	-15.468	<0.0001
Service and sales workers	-4.524	0.0121
Skilled agricultural, forestry and fishery workers	-7.485	0.0002
Trade workers and elementary occupations	-	-
Family income		
Q4	3.273	0.3890
Q3	3.377	0.2592
Q2	2.831	0.3297
Q1	-	-
Gender		
Male	-1.164	0.4323
Female	-	-
Age (Years)		
<44	-	-
45 - 64	-1.220	0.4824
65 - 74	-6.980	0.0006
>75	-5.901	0.0170
Educational level		
Less than high school	-3.125	0.2617
High school education	-0.619	0.8063
College graduate	-	-

\*EQ-VAS, EuroQOL visual analog scale; \*p-values by mixed-model analysis

and fishery workers had the highest distribution in all self-perceived health groups (Table 1).

The average EQ-VAS score for self-perceived health status decreased in the following order: 'good' > 'normal' > 'bad'. Regarding 'mutual respect in the workplace', no significant difference was observed, with the exception of those with a 'normal' self-perceived health status (yes: 71.3, no: 61.3; p<0.05). The 'free emotional expression in the workplace' factor differed significantly only for those with a 'bad' self-perceived health status (yes: 62.4, no: 60.0; p<0.05). According to type of occupation, the EQ-VAS score varied with self-perceived health status, but was significantly different only in the 'normal' self-perceived health status group (Table 2).

In the mixed-model analysis, the 'no mutual respect in the workplace' group had a lower EQ-VAS score than the other groups (no: -3.418; p<0.05) and a lower EQ-VAS score of 'no' in the 'free emotional expression in the workplace' (no: -3.622; p<0.05). Clerks had a lower EQ-VAS score than the other occupation types (managers and professionals: 0.798; p>0.05, clerks: -15.468; p<0.05, service and sales workers: -4.524; p<0.05, skilled agricultural, forestry and fishery workers: -7.485; p<0.05; Table 3).

Trends in factors at the workplace and QOL among cancer survivors varied depending on self-perceived health status. In those with a 'bad' self-perceived health status, the EQ-VAS differed only according to family income; a lower family income was associated with a lower QOL (Q3: -4.753; p>0.05, Q2: -9.102; p<0.05, Q1: -8.269;

**Table 4. Mixed-Model Analysis Results of EQ-VAS Based on Self-Perceived Health Status (Estimated Regression Coefficient, p-value\*)**

	Self-perceived health					
	Bad		Normal		Good	
Mutual respect in the workplace						
Yes	-	-	-	-	-	-
No	0.853	0.7016	-14.666	<0.0001	0.870	0.8528
Free emotional expression in the workplace						
Yes	-	-	-	-	-	-
No	-2.837	0.1808	-4.088	0.0395	-2.308	0.5855
Occupation						
Managers and professionals	2.500	0.4850	2.274	0.5621	7.222	0.1683
Clerks	-7.979	0.1586	-20.041	<0.0001	-5.307	0.5379
Service and sales workers	-1.757	0.5174	-4.962	0.0528	-1.065	0.8492
Skilled agricultural, forestry and fishery workers	-2.663	0.3122	-9.633	0.0056	-2.321	0.6716
Trade workers and elementary occupations	-	-	-	-	-	-
Family income						
Q4	-	-	-	-	-	-
Q3	-4.753	0.0757	-1.540	0.5195	6.627	0.1750
Q2	-9.102	0.0016	0.813	0.7919	1.230	0.8389
Q1	-8.269	0.0112	0.778	0.8537	10.180	0.1867
Gender						
Male	-0.670	0.7353	-0.069	0.9775	0.103	0.9806
Female	-	-	-	-	-	-
Age (Years)						
<44	-1.616	0.7334	7.596	0.2408	27.701	0.0076
45 - 64	1.900	0.6107	0.514	0.9194	22.104	0.0031
65 - 74	1.597	0.6523	-2.159	0.6704	17.192	0.0250
>75	-	-	-	-	-	-
Educational level						
Less than high school	-3.731	0.4569	4.182	0.3188	3.810	0.5232
High school education	2.448	0.6015	2.822	0.4621	1.446	0.7825
College graduate	-	-	-	-	-	-

\*EQ-VAS, EuroQOL visual analog scale; \*p-values by mixed-model analysis

p<0.05).

Workplace variables differed only among those with 'normal' self-perceived health status. The 'no mutual respect at the workplace' group had lower EQ-VAS scores than the other groups (no: -14.666; p<0.05). Additionally, a lower EQ-VAS score was associated with difficulty in emotional expression at the workplace (no: -4.088; p<0.05). According to occupation type, clerks, skilled agricultural and forestry and fishery workers had lower EQ-VAS scores than the other types (managers and professionals: 2.274; p>0.05, clerks: -20.041; p<0.05, service and sales workers: -4.962; p>0.05, skilled agricultural, forestry and fishery workers: -9.633; p<0.05). In those with a 'good' self-perceived health status, EQ-VAS scores differed significantly only among age groups; younger subjects had higher EQ-VAS scores than older subjects (less than 44 years: 27.701; p<0.05, 45-64 years: 22.104; p<0.05, 65-74 years: 17.192; p<0.05; Table 4).

## Discussion

To identify the factors affecting the QOL of cancer survivors at the workplace, we analyzed the association between 'mutual respect' and 'free emotional expression' with QOL. Although the cancer survivors had the same level of disease severity, the QOL may have been perceived differently. Thus, we performed an additional analysis according to self-perceived health status.

The results showed that the overall QOL of cancer survivors was associated with 'mutual respect', 'free emotional expression', occupation, and age. Different trends of QOL based on self-perceived health were identified in the additional analysis. In the 'bad' self-perceived health group, QOL differed significantly according to income; the QOL of cancer survivors with a low income was lower than in those with higher income levels. Conversely, the low QOL of the 'normal' group was caused by 'no mutual respect' and 'no free emotional expression' in the workplace. Lastly, the QOL of the 'good' self-perceived health status group was higher in the younger age groups.

Our findings are similar to those of previous studies of the association between the working environment and QOL of cancer survivors (Spelten et al., 2002; Main et al., 2005; Hoving et al., 2009; Fantoni et al., 2010; Steiner et al., 2010). Additionally, several studies focused on difficulty or discrimination at the workplace (Hoffman, 1988; Schultz et al., 2002; Tan et al., 2012). However, we considered additionally self-perceived health status as a factor; it had a different relationship with the each variable. Although we did not assess the specific reasons, the differences in trends might be due to the reasons for returning to work. Subjects with a 'bad' self-perceived health status returned to work for financial reasons; thus their QOL was affected by income. By contrast, subjects with a 'normal' self-perceived health status were affected by their working environment because their objective in returning to work was to regain a normal life. Therefore, discrimination at the workplace could influence their QOL, whereas the age of those with a 'good' self-perceived health status influenced their QOL, similar to the general

population. In other words, cancer survivors should be managed individually based on their perceived health status, and policy makers should formulate guidelines according to survivors' priorities after taking into consideration their self-perceived health status.

This study had several strengths. First, this study included workplace factors, which facilitated analysis of the emotional aspects of cancer survivors who returned to work. Additionally, our subgroup analysis according to self-perceived health status is meaningful for the management of cancer survivors. Finally, to our knowledge, this is the first report of the relationship between QOL (measured by EQ-VAS) and the workplace factors of cancer survivors who returned to work by the self-perceived health status.

However, this study had several limitations. First, it was of a cross-sectional design; hence, the ability to identify a causal relationship between QOL and the workplace factors in cancer survivors is limited. Furthermore, the types and stages of cancer were not considered; therefore, the results may not be applicable to all types of cancer, and further study is warranted. Additionally, we considered only 'mutual respect' and 'free emotional expression' as variables in the working environment; thus, the results may not reflect all workplace situations.

Despite these limitations, our findings suggest a relationship between QOL and factors at the workplace for cancer survivors. Due to the increasing number of cancer survivors, more may be returning to work; thus, their management in the workplace is important. Based on our results, the support of cancer survivors who return to the workplace can be improved.

In conclusion, a significant relationship between cancer survivors' QOL and factors at the workplace was identified, although further studies of this relationship are needed. This will facilitate formulation of policy and efforts to prevent and manage the decline in the QOL of cancer survivors returning to work.

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