

Factors Affecting the Quality of Life of Working Cancer Survivors: Based on the 6th and 7th (2014, 2016, 2018) Korean National Health and Nutrition Examination Survey (KNHANES)

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Purpose: The purpose of the study was to compare the relationship between subjective health status, mental health, and quality of life among cancer survivors, who are workers, and to identify the factors affecting the quality of life. **Methods:** This study conducted a second data analysis using data from the 6th (2014, 2016) and 7th (2018) Korea National Health and Nutrition Examination Survey. Retrospective data searching was performed and finally a sample of 205 cancer survivors, who are workers was included. The data were analyzed by descriptive statistics, t-tests, ANOVA, Pearson correlation, and multiple regression analysis. **Results:** The regression model explained 33.3% of the quality of life, and the influencing factors were depression ($\beta=-.309, p<.001$), age ($\beta=-.288, p<.001$), subjective health status ($\beta=-.183, p=.005$), and gender ($\beta=-.135, p=.024$). **Conclusion:** In order to improve the quality of life of cancer survivors, who are workers, mental health such as depression must be assessed and actively managed. To promote mental health, an intervention program that can improve aspects of health such as physical and spiritual health has been developed to improve the overall quality of life.

Key Words: Neoplasm, Survivorship, Quality of life

INTRODUCTION

1. Background

Based on the statistical report, from 1999 to 2017, Korea had 1.86 million cancer patients, accounting for 3.6% of the total population in 2017.¹⁾ The 5-year relative survival rate of cancer patients in Korea from 2013 to 2017 was 70.4%, an increase of 16.4% compared to 12 years ago, when the 5-year relative survival rate was 54%(2001 to 2005). After a cancer diagnosis, it is estimated that more than 2 out of 3 people survive for 5 years or more.²⁾ This increased number of cancer survivors need to secure economic stability to support their continuous health maintenance and management, and so the need for them to engage in economic activities such as returning to work or employment is also increasing.^{3,4)}

In fact, economic activity means more than economic power for

cancer survivors, because it implies a return to a life which was temporarily cut off due to cancer treatment, and has an important impact on the overall quality of their life through social relations and social status recovery.⁴⁾ However, cancer survivors experience various physical and physiological symptoms and changes after cancer treatment,⁵⁾ and have difficulties performing daily life activities as well as in maintaining interpersonal relationships and social functions due to fatigue, pain, and limited physical functions and activities.⁶⁾ In addition to physical symptoms, cancer survivors continue to experience mental health symptoms such as depression, anxiety, stress, uncertainty, and fear of recurrence,^{7,8)} which affects their work ability, leading to difficulties in re-adaptation to work life, job duties, and interpersonal relationships. They face a range of difficulties, such as performance and interpersonal problems.^{8,9)} The difficulty in returning to social role functions prior to cancer diagnosis eventually negatively affects their quality of life,¹⁰⁾ so their changed health status and mental health are important factors that should be considered to improve their new life adaptation and quality of life. Therefore, an approach to managing the quality of life of working cancer survivors should be studied.

Looking at the previous studies on working cancer survivors, many have been conducted on specific occupational groups, such as nurses,¹¹⁾ dental hygienists,¹²⁾ and port stevedores,¹³⁾ etc. and there have been many studies on physical and psychological symptoms,⁹⁾ the develop-

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ment of measuring tools for quality of life at work,³⁾ and literature review of intervention programs related to quality of life.¹⁴⁾ However, considering the high incidence and survival rate of cancer in Korea and the need for cancer survivors to engage in economic activities, it is necessary to support research that examines the overall life of working cancer survivors from various perspectives.

Therefore, in this study, by identifying the relationship between the subjective health status, mental health and quality of life experienced by cancer survivors who are workers, it is intended to derive findings that can be utilized to develop effective interventions to improve their quality of life in hospitals and industrial sites based on this.

2. Purpose of study

The purpose of this study was to compare the relationship between subjective health status, mental health, and quality of life of working cancer survivors, and to identify factors that affect their quality of life. The specific objectives are as follows. First, identify the demographic and sociological characteristics of working cancer survivors. Second, identify the subjective health status, mental health, and quality of life of working cancer survivors. Third, identify the level of quality of life of working cancer survivors according to the demographic and sociological characteristics. Fourth, identify the correlation between the subjective health status, mental health, and quality of life of working cancer survivors. Fifth, identify factors that affect the quality of life of working cancer survivors.

METHODS

1. Study design

This study was designed as a secondary data analysis derived from the 6th (2014, 2016) and 7th (2018) Korean National Health and Nutrition Examination Survey. It was a descriptive correlation study that would compare the relationship between the subjective health status, mental health, and quality of life of working cancer survivors, and identify factors affecting the quality of life.

2. Study subjects

In this study, data from the 6th (2014, 2016) and 7th (2018) Korean National Health and Nutrition Survey were used, and the raw data were requested and received upon approval from the Korean National Health and Nutrition Survey website. The received data includes 23,692

people aged 1 or older, extracted through a two-stage stratified sampling method, and the subjects of this study who were selected met the following selection criteria.

1) Selection criteria

(1) Cancer survivors

The definition of cancer survivor broadly includes those who are diagnosed with cancer and are in all stages reaching to life balance,¹⁵⁾ but in this study, was limited to people who were diagnosed with cancer and answered 'No' to a question asking whether they have cancer now. The cancers included gastric cancer, liver cancer, colon cancer, breast cancer, cervical cancer, lung cancer, thyroid cancer and all other cancers.

(2) Workers

In this study, this was defined as people who answered 'Yes' to a question on whether they are currently engaged in an economic activity.

2) Calculation of the number of subjects

Of the 23,692 subjects collected in the 6th (2014, 2016) and 7th (2018) Korean National Health and Nutrition Survey, 209 who met the selection criteria were selected, and 205 people were ultimately analyzed retrospectively after people who did not answer for some key variables were excluded.

The G power 3.1.9.7 program was used to confirm the appropriateness of the sample size of this study. When the effect size of multiple regression analysis (f^2) was .15, significance level (α) was .05, the number of predictors was 11, and the number of subjects was 205 people, the power ($1-\beta$) was calculated as .97, so it was considered that the purpose of this study could be achieved using the sample size in this study.

3. Instruments

1) Demographic and sociological characteristics

The demographic and sociological characteristics included gender, age, marital status, income level, elapsed time since cancer diagnosis, the presence of a chronic disease (hypertension, diabetes, dyslipidemia), whether or not the subject was a waged worker, working hours, and work type.

2) Subjective health status

Subjective health status was measured using the single question:

"What do you think your health is like?". In terms of score, 1 is 'very good,' 2 is 'good,' 3 is 'normal,' 4 is 'bad,' and 5 is 'very bad.' A higher score indicates a lower subjective health status.

3) Mental health

Mental health was measured using stress perception and depression. Regarding the stress perception score, 1 is 'feeling very much stress,' 2 is 'feeling a lot of stress,' 3 is 'feeling some stress,' and 4 is 'feeling little stress.' A higher score means a lower stress perception. Depression was measured using the depression screening tool (Patient Questionnaire-9; PHQ-9),¹⁶⁾ based on the question "In the last 2 weeks, how often did you suffer from the symptoms listed below?" A score of 0 is 'not at all,' 1 is 'on multiple days,' 2 is 'for more than a week,' and 3 is 'almost every day.' As the score increases, the depression is higher.

4) Quality of life

Quality of life was measured using a tool developed by EuroQol (<http://euroqol.org/>). This tool covers 5 sub areas: athletic ability, self-management, daily life, pain/discomfort, and anxiety/depression. Regarding the score of each area, 1 is 'No problem at all,' 2 is 'Some problems,' and 3 is 'there is a very serious problem.' As the score increases, the quality of life is lower. Based on this information, the score of overall quality of life (EQ-5D) was calculated by applying a weighting formula¹⁷⁾ to convert the score from -0.171, which is the lowest quality of life, to 1, which means a completely healthy status. Therefore, as the score for overall quality of life increases, the quality of life becomes higher.

4. Data collection

In this study, the raw data used was obtained from the 6th (2014, 2016) and 7th (2018) Korean National Health and Nutrition Survey, which has been conducted by the Korea Disease Control and Prevention Agency since 1999 to identify the health and nutritional level of the people and also to establish related policies. The 2-stage stratified sampling method was used for the target population of people age 1 or older residing in Korea, and the data about 23,692 people were collected. The data was processed in a manner that prevented the identification of subjects, and was intended to be used only for public purposes such as statistical analysis and academic research.

5. Data analysis

The collected data were analyzed as follows using the SPSS/WIN

25.0 software package.

1) The demographic and sociological characteristics of the subjects were analyzed using frequency and percentage, which are descriptive statistics.

2) The subjective health status, mental health, and quality of life were analyzed using the mean and standard deviation, which are descriptive statistics.

3) The quality of life according to the demographic and sociological characteristics of the subjects was analyzed using t-test and variance analysis, and post-hoc test was verified using the Scheffé method.

4) The correlation among subjective health status, mental health, and quality of life was analyzed using Pearson's correlation coefficient.

5) The factors influencing the subject's quality of life were analyzed using multiple regression analysis.

6. Ethical considerations

After approval was granted by the Institutional Review Board (IRB) of Yonsei University Medical Center, this study was carried out. As a secondary analysis study based on public data, IRB exempted the study from review (Y-2020-0038).

RESULTS

1. General Characteristics of Subjects

In terms of the demographic and sociological characteristics of the subjects, the number of males was 78 (38.0%) and the number of females was 127 (62.0%), i.e. there were more females than males. The average age was 59.0 ± 11.3 , with 139 (67.8%) under the age of 65 in the group and 66 (32.2%) age 65 or more. 165 (80.5%) had a spouse, i.e. the majority were married, and by income quartile (household) there were 42 (20.5%) in low, 51 (24.9%) in medium low, 60 (29.3%) in medium high, and 52 (25.4%) in high.

In terms of the disease-related characteristics of the subjects, the average duration since the cancer diagnosis was 10.8 ± 7.5 years; for 28 patients (13.7%) in the group it was less than 5 years, for 75 patients (36.6%) it was 5 years or more and less than 10 years, and for 102 patients (49.8%) it was 10 years or more. 92 (44.9%) patients had chronic diseases.

Regarding the vocational characteristics of the subjects, 100 (48.8%) were waged workers and the average working hours per week was 36.6 ± 18.8 hours, with 129 people (62.9%) in the group working less than 40 hours, and 76 people (37.1%) working over 40 hours. Regarding work

type, the majority worked during daytime, 174 people (84.9%) (Table 1).

2. Subjective health status, mental health and quality of life

The average of subjects' subjective health status score was 3.13 ± 0.80 in the range of 1 to 5 points. In addition, the average stress perception score was 2.91 ± 0.75 in the range of 1 to 4 points and the average depression score was 2.59 ± 3.58 in the range of 0 to 27 points. In addition, the average subjects' quality of life (EQ-5D) score was 0.94 ± 0.10 in the range of -0.171 to 1 point and in the self-management category, the quality of life was the highest among the sub-categories (Table 2).

3. Difference in quality of life depending on subjects' characteristics

There were significant differences in quality of life based on gender ($t=2.28, p=.02$), age ($t=4.53, p<.001$), and income level ($F=8.66, p<.001$). Males (0.96 ± 0.08) had a higher quality of life than females (0.93 ± 0.11) and the group under 65 years old (0.97 ± 0.07) had a higher quality of life than the group 65 years or older (0.89 ± 0.13). The group in the medium high income quartile (0.95 ± 0.08) had a higher quality of life than the low group (0.89 ± 0.14), and the group in the high income quartile (0.99 ± 0.04) had a higher quality of life than the low

group (0.89 ± 0.14) and the medium low group (0.93 ± 0.11) (Table 3).

4. Relationship between subject's subjective health status, mental health and quality of life

Subjects' quality of life had a significant correlation with subjective health status ($r=-.37, p<.001$), stress perception ($r=.17, p=.013$), and depression ($r=-.42, p<.001$). In other words, as the subjective health status was higher, the stress perception was lower; as the depression level was lower, the quality of life was higher (Table 4).

5. Factors affecting subjects' quality of life

To identify factors affecting subjects' quality of life, the gender, age, and income level, which showed a significant difference in terms of quality of life among the general characteristics, and the subjective health status, stress perception, and depression, which showed a significant correlation with quality of life, were entered to perform a multiple regression analysis. Of these, the categorical variables, i.e., gender and age, were treated as a dummy variable; the gender was male and the age was under 65.

When the Durbin-Watson correlation coefficient was checked to verify the basic assumptions of the regression analysis on the quality of life, there was no autocorrelation with the coefficient 1.83. When the tolerance limit and the variance inflation factor (VIF) for the multicollinearity test were measured, the tolerance limit was 0.70~0.93, which was higher than 0.1, and the dispersion expansion factor was 1.08~1.42, which was less than 10, confirming that there was no problem in terms of multicollinearity.

Through a multiple regression analysis, it was determined that the model was significant ($F=17.94, p=<.001$) and showed 33.3% of variance. The depression ($\beta=-.309, p<.001$) was the strongest predictor,

Table 1. General Characteristics of Working Cancer Survivors ($N=205$)

Variables	Categories	n (%) or $M \pm SD$
Gender	Male	78 (38.0)
	Female	127 (62.0)
Age (year)		59.0 ± 11.3
	< 65	139 (67.8)
	≥ 65	66 (32.2)
Spouse	Yes	165 (80.5)
	No	40 (19.5)
Income level	Low	42 (20.5)
	Middle low	51 (24.9)
	Middle high	60 (29.3)
	High	52 (25.4)
Time since cancer diagnosis (years)		10.8 ± 7.5
	< 5	28 (13.7)
	$5 \leq \sim < 10$	75 (36.6)
	≥ 10	102 (49.8)
Comorbidity	Yes	92 (44.9)
	No	113 (55.1)
Wage earner	Yes	100 (48.8)
	No	105 (51.2)
Work hours (hours/week)		36.6 ± 18.8
	≤ 40	129 (62.9)
	> 40	76 (37.1)
Work type	Day	174 (84.9)
	Night	20 (9.8)
	Shift	11 (5.4)

Table 2. Subjective Health Status, Stress Perception, Depression and Quality of Life of Working Cancer Survivors ($N=205$)

Variables	Categories	Total score
		$M \pm SD$
Subjective health status		3.13 ± 0.80
Stress perception		2.91 ± 0.75
Depression		2.59 ± 3.58
Quality of life	Total	0.94 ± 0.10
	Motor ability	1.19 ± 0.40
	Self-management	1.03 ± 0.18
	Daily activities	1.07 ± 0.28
	Pain/discomfort	1.24 ± 0.46
	Anxiety/depress	1.11 ± 0.33

Table 3. Quality of Life according to Sociodemographic Characteristics of Working Cancer Survivors (N = 205)

Characteristics	Categories	n	Quality of life		
			M ± SD	t or F	p (Scheffé)
Gender	Male Female	78 127	0.96 ± 0.08 0.93 ± 0.11	2.28	.02
Age (year)	< 65 ≥ 65	139 66	0.97 ± 0.07 0.89 ± 0.13	4.53	<.001
Spouse	Yes No	165 40	0.95 ± 0.09 0.92 ± 0.13	-1.27	.21
Income level	Low ^a Middle low ^b Middle high ^c High ^d	42 51 60 52	0.89 ± 0.14 0.93 ± 0.11 0.95 ± 0.08 0.99 ± 0.04	8.66	<.001 (a<c) (a, b<d)
Time since cancer diagnosis (years)	< 5 5 ≤ ~ < 10 ≥ 10	28 75 102	0.97 ± 0.06 0.93 ± 0.11 0.94 ± 0.10	2.03	.13
Comorbidity	Yes No	92 113	0.93 ± 0.12 0.95 ± 0.08	1.65	.10
Wage earner	Yes No	100 105	0.94 ± 0.12 0.94 ± 0.08	-0.36	.72
Work hours (hours/week)	≤ 40 > 40	129 76	0.93 ± 0.11 0.95 ± 0.08	-1.26	.21
Work type	Day Night Shift	174 20 11	0.94 ± 0.11 0.97 ± 0.06 0.97 ± 0.05	1.92	.15

Table 4. Correlations among Subjective Health Status, Stress Perception, Depression and Quality of Life of Working Cancer Survivors (N = 205)

Variables	Subjective health status	Stress perception	Depression
	r (p)	r (p)	r (p)
Stress perception	-.29 (<.001)		
Depression	.37 (<.001)	-.47 (<.001)	
Quality of life	-.37 (<.001)	.17 (.013)	-.42 (<.001)

followed by age ($\beta = -.288$, $p < .001$), subjective health status ($\beta = -.183$, $p = .005$), and gender ($\beta = -.135$, $p = .024$). These had an effect on the quality of life, in the order listed (Table 5).

DISCUSSION

This study analyzed the factors affecting the quality of life of working cancer survivors using the data from the 6th (2014, 2016) and 7th (2018) Korean National Health and Nutrition Survey. This study found that the quality of life of working cancer survivors was 0.94 ± 0.10 points, which is higher than 0.92 ± 0.01 and 0.916 ± 0.007 , the results of prior studies^{18,19)} that examined the factors affecting the quality of life of adult cancer patients. The result was lower than the quality of life in a prior study²⁰⁾ for general workers. From this, it can be understood

that working cancer survivors have a higher quality of life than cancer patients under treatment, but their quality of life is lower than that of ordinary workers. It is likely that the working cancer survivors have gone through the process cancer patients should go through, with many physical, psychological, and social difficulties during the treatment process, but the discomfort persists even after the treatment and is affecting their daily and social life.⁸⁾ Therefore, the quality of life of working cancer survivors should be improved and maintained even after the treatment period is over, through continuous interest and observation.

In this study, the factors affecting the quality of life of working cancer survivors include depression, gender, subjective health status, and age. Depression was the first influencing factor affecting the quality of life of working cancer survivors. Cancer survivors experience different

Table 5. Factors Influencing Quality of Life of Working Cancer Survivors

(N = 205)

Variables	Categories	B	SE	β	t	p	95% CI
(Constant)		1.076	.043		24.996	<.001	0.99~1.16
Depression		-0.009	.002	-.309	-4.530	<.001	-0.02~-0.01
Age (ref: < 65)	≥ 65	-0.064	.013	-.288	-4.825	<.001	-0.09~-0.04
Subjective health status		-0.023	.008	-.183	-2.872	.005	-0.04~-0.01
Gender (ref: Male)	Female	-0.028	.012	-.135	-2.277	.024	-0.05~-0.01
Income level		0.010	.006	.112	1.769	.078	-0.01~0.02
Stress perception		-0.006	.009	-.048	-0.732	.465	-0.02~0.01
$R^2 = .352$, Adjusted $R^2 = .333$, F = 17.944, p < .001							

B= Unstandardized beta; SE= Standard error; CI= Confidence interval.

physical, social, and functional changes compared to their life prior to their cancer diagnosis, and also experience mental health symptoms such as depression.^{5,6,8)} When they experience these depressive symptoms, quality of life may deteriorate.¹⁸⁾ In addition, a problem such as subjective health status and stress perception occurs to a worker in a working environment, it will affect depression, which can ultimately affect the quality of life.^{21,22)} In this way, working cancer survivors may experience mental symptoms such as depression in the process of trying to maintain their former role as a worker after they experienced a cancer. Therefore, hospitals and work sites should pay attention to the mental health of working cancer survivors to ensure their proper examination and handling in order to help them maintain and improve their health.

Next, regarding the general characteristics of subjects, gender was found to be an important factor affecting quality of life. In this study, women were found to have a lower quality of life than men. According to a prior study that confirmed the quality of life of workers depending on gender, women experience discrimination in the workplace more often than men in terms of working environment or conditions.^{23,24)} Therefore, women may experience more stress in social life compared to men.²⁰⁾ In addition, it is likely that the physical and mental health status of female workers are affected by the burden they must take on both at work and at home, which ultimately affects their quality of life.^{21,24)} However, this study does not include all the variables that would explain the working environment in detail, so it is difficult to provide a more accurate description of this phenomenon. As such, it is something to consider in future studies.

In addition, in this study, subjective health status was also found to be a factor influencing the quality of life of working cancer survivors. In many studies involving the general public, cancer patients, and

workers, subjective health status was found to be a major factor affecting quality of life.^{18,20,25,26)} It is likely that physical and mental health aspects can be a constraint in daily and social life, and in particular is likely that they will have a great influence in the working environment to the working cancer survivors, i.e. the subjects of this study, who are returning to work after cancer treatment. But as health is a broad concept that includes many aspects, it is necessary to accurately define the meaning of health perceived by individuals through future studies. In addition, 44.9% of subjects in this study had chronic diseases. It will be also necessary to assess the manner in which such chronic diseases affect the subjective health status of working cancer survivors.

Lastly, age was found to be a factor affecting the quality of life of working cancer survivors. In this study, it was found that quality of life was lower among subjects 65 or higher compared to subjects under 65. This is because there is biological aging as people get older and experiences limitations in the working environment,²⁷⁾ and instability in the working environment, such as working as a non-regular worker, may affect quality of life.^{25,28,29)} As the number of elderly cancer survivors will gradually increase due to the aging of the productive manpower through the continuous increase in the relative survival rate of cancer patients and the increase in the average life expectancy,³⁰⁾ it is necessary to take an active interest in their quality of life and to provide intervention.

Therefore, if a nursing intervention program in terms of comprehensive health care including depression and subjective health status, which are factors influencing the quality of life of working cancer survivors, identified through this study, is developed and applied, it will be effective in improving their quality of life. In addition, it will be likely that more effective programs can be developed if women and elderly workers, who are more vulnerable to quality of life issues in terms of

gender and age, are also considered.

CONCLUSION

This study uses data from the 6th (2014, 2016) and 7th (2018) Korean National Health and Nutrition Survey to identify factors that affect the quality of life of working cancer survivors and to provide basic data to develop programs to support working cancer survivors. Factors influencing the quality of life of working cancer survivors include depression, age, subjective health status, and gender. The explanatory power was 33.3%. Therefore, to improve the quality of life of working cancer survivors, it is necessary to check and actively manage mental health factors such as depression. In addition to mental health, a program including physical and mental health should be developed to comprehensively improve their quality of life.

As this study was designed as a cross-sectional study, it is difficult to interpret causal relations. In addition, it was not possible to analyze all of the various aspects of health, as this is a secondary analysis study. Since wage workers, the self-employed, employers, and unpaid family workers are all included in this study, the differences between them are not adequately considered. Therefore, follow-up research should consider this point. In addition, since the characteristics of each cancer type were not reflected, a follow-up study that considers this is also suggested.

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