

Factors affecting the health-promoting behavior of thyroid cancer survivors: Comparison by stage of cancer survivorship

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Abstract

Purpose: The purpose of this study was to identify differences in factors affecting health-promoting behaviors according to the survival stage of thyroid cancer survivors.

Methods: The factors affecting the health-promoting behavior of thyroid cancer survivors included general characteristics, social support, self-efficacy, fear of recurrence, and symptoms. There were 354 patients diagnosed with thyroid cancer and underwent a related surgery, who completed the questionnaire and were included in the data analysis. Multiple regression analysis was used to analyze factors affecting the health-promoting behavior according to survival stage.

Results: Among the sub-areas of health-promoting behavior, thyroid cancer survivors had the highest score of 2.83/4.00 in the health responsibility area and the lowest score of 2.36/4.00 in the exercise area. The factors affecting the health-promoting behavior of thyroid cancer survivors differed by survival stage. In the acute stage, the factors of health-promoting behavior were self-efficacy ($t = 4.76, p < .001$) and social support ($t = 3.54, p < .001$). In the extended stage, symptoms ($t = -3.65, p < .001$), social support ($t = 2.61, p = .011$), fear of recurrence ($t = 2.18, p = .032$), and receipt of radioiodine treatment ($t = -2.18, p = .032$) were found to be significant variables that affected health-promoting behaviors. In the permanent stage, social support ($t = 2.79, p = .007$), receipt of radioiodine treatment ($t = -3.21, p = .002$), and age ($t = -2.77, p = .007$) were significant variables that affected health-promoting behaviors.

Conclusion: The experience of thyroid cancer survivors varies as they progress through the survival stages, thus health-promotion interventions should be tailored to each survival stage.

Introduction

The incidence of thyroid cancer is increasing worldwide, and the 5-year survival rate for thyroid cancer patients is very high, 98–100% [1-3]. Thyroid cancer is the most common cancer among young adults [4]. Because thyroid cancer has a better prognosis, a much higher survival rate, and earlier onset than other adult-cancers, long-term healthcare for thyroid cancer survivors is very important. Cancer patients continue to experience problems with symptoms after treatment and need healthcare interventions that can be applied to their daily lives [5]. Thyroid cancer patients have a similar or lower quality of life compared with other cancer patients, and they have been shown to experience various side effects after treatment [6, 7]. Proper health promotion among cancer patients plays an important role in improving their quality of life related to health [8]. Therefore, it is necessary to be aware of factors that related to patient willingness to engage in health-promoting behaviors. Health promotion is the process of improving one's own health and can be described using six areas: health responsibility, self-realization, physical activity, nutrition habits, interpersonal relations, and stress management [9, 10]. In addition, personal characteristics, self-efficacy, social support, and perceived threats are known to affect the performance of health-promoting behaviors [9, 11]. In a previous study of cancer survivors, health behaviors differed according to the time of diagnosis, physical symptoms, and fear of recurrence [12, 13].

Patients with thyroid cancer are predicted to have different health behaviors depending on their individual disease-related characteristics, but few studies have reported on the health-promoting behavior of thyroid cancer patients. Because thyroid cancer survivors need long-term follow-up, management of other chronic diseases, and prevention of secondary cancer, they need to engage in health-promoting behaviors throughout life. The needs that cancer survivors have for healthcare and services are classified into acute survival (less than 2 years after being diagnosed with cancer), extended survival (more than 2 years and less than 5 years after cancer diagnosis), and permanent survival (more than 5 years after cancer diagnosis) [14]. Medical staff need to understand the emotional and physical problems that change as cancer survivors proceed through treatment. A cancer diagnosis can be a trigger for health behavior change; within 1 month after a cancer diagnosis, patients reported improved physical activity and dietary changes [15]. In addition, long-term cancer survivors (more than 5 years after cancer diagnosis) reported no differences from the general population in screening behavior for secondary diseases or physical activity, though their interest in the physical aspects of health was reduced compared with their interest in its psychological and social aspects [16, 17]. In summary, the health-promoting behavior of cancer patients changes with their survival stage, and it is necessary to confirm which factors influence the health-promoting behavior of each stage of survival. In patients with long-term survival of thyroid cancer, the factors affecting health-promoting behaviors may change depending on the stage of survival. Few studies have examined differences that occur with the survival stages of patients with thyroid cancer. Therefore, this study identifies differences among thyroid cancer survivors by survival stage, along with the factors that influence the use of health-promoting behaviors.

Materials And Methods

Setting and participants

This study analyzes the level of social support, self-efficacy, fear of recurrence, symptoms, and health-promoting behaviors of patients with thyroid cancer, along with factors that affect the use of health-promoting behaviors at each stage of survival. It is a cross-sectional and descriptive correlation investigation. The subjects of this study were adults (aged 18 years or older) who had undergone surgery to treat thyroid cancer. Those who were diagnosed with cancer other than thyroid cancer were excluded. This study collected data from patients visiting an outpatient clinic or a thyroid cancer online community from December 30, 2019, to January 31, 2020. Questionnaire responses were collected from 43 outpatients and 317 patients who responded online. Data analysis included 354 patients excluding 6 patients diagnosed with secondary cancers other than thyroid cancer. By survival stage, 147 respondents were in the acute stage, 112 respondents were in the extended stage, and 95 respondents were in the permanent stage.

For outpatient data collection, the study was explained to subjects who visited the outpatient clinic and met the selection criteria. If they agreed to participate in the study, they completed the questionnaire on paper. The online respondents were from a community for thyroid cancer patients established at the Naver portal site. We announced the research to the online community and received questionnaire

responses from those who voluntarily agreed to participate in the research through SurveyMonkey (<https://en.surveymonkey.com/>). This study was approved by the hospital's institutional review board. Participants were given the researcher's email address and telephone number. To protect personal information, all data were processed anonymously, and access to people other than the researcher was restricted.

Survey Instrument

The questionnaire used in this study contained 103 items about individual characteristics, health-promoting behaviors, social support, self-efficacy, fear of recurrence, and symptoms. The individual characteristic information collected was age, sex, marital status, education, family monthly income, employment status, frequency accessing online community, cancer type, extent of surgery, cancer recurrence, and number of 131 therapies received. To measure health promoting behavior, the Health Promoting Lifestyle Profile (HPLP) developed by Pender was translated by Oh and Hong and edited to make it applicable to survivors of thyroid cancer [9, 10]. The HPLP uses six sub-concepts: self-realization, health responsibility, exercise, nutrition, interpersonal relationships, rest, and stress management. In this study, the original questionnaire was corrected and supplemented to a total of 38 questions: 7 questions about self-actualization, 11 questions about health responsibility, 4 questions about exercise, 5 questions about nutrition, 5 questions about interpersonal relationships, and 6 questions about relaxation and stress management. All questions were answered using a four-point Likert scale in which a higher score indicated a higher participation in health-promoting behaviors. In this study, Cronbach's $\alpha = .90$, which indicates the reliability of the HPLP in measuring health-promoting behaviors. Social support was measured using the Multidimensional Scale of Perceived Social Support (MSPSS) developed by Zimet et al. and translated by Shin and Lee [18, 19]. The MSPSS is a 12-item scale with three subscales: family, friends, and significant others. The questions were answered using a five-point Likert scale in which a higher score indicated better social support. At the time of tool development, the MSPSS had a Cronbach's $\alpha = .83$, and in this study, Cronbach's $\alpha = .94$. The Cancer Survivors' Self-Efficacy Scale (CSSES) was developed by Foster et al. [20]. This study used the Korean version (CSSES-K) developed by Kim et al. [21]. It contains 10 questions, each of which is given 1 to 10 points on a Likert scale, with higher item scores indicating higher self-efficacy. In this study, the CSSES-K's Cronbach's α was 0.91. The Fear of Progression Questionnaire (FOP-Q) developed by Herschbach et al. was edited by Mehnert et al. to reduce the number of questions for cancer patients (FOP-Q-12). [22, 23]. This study used the FOP-Q-12 in Korean developed by Shim et al. [24]. Each of the 12 questions is given 1 to 5 points on a Likert scale, with higher scores indicating a greater fear of cancer recurrence. In this study, the Cronbach's α was .90. For the symptoms, this study used the quality of life tool for Korean thyroid cancer survivors (KT-QoL) based on the original work on the thyroid cancer-specific City of Hope-QOL Scale [25, 26]. The 14 original KT-QoL questions confirm the physical aspects of thyroid-cancer patients' symptoms. In this study, two questions were added. Each item is given 0 to 10 points on a Likert scale, with higher item scores indicating more severe symptoms. The Cronbach's α for the 16 questions used in this study was 0.89.

Data analysis

The collected data were analyzed using the IBM Statistical Package for Social Sciences (SPSS) version 25.0. Differences according to survival stage were analyzed using the χ^2 -test. Differences in the performance of health-promoting behavior, personal characteristics, social support, self-efficacy, fear of recurrence, and symptoms by survival stage were analyzed using one-way analysis of variance (ANOVA), and post-analysis was conducted using the Tukey HSD test. The correlations between the use of health-promoting behaviors and social support, self-efficacy, fear of recurrence, and symptoms were analyzed using Pearson's correlation coefficients. Multiple regression analyses were performed to determine the factors that affect participation in health-promoting behaviors.

Results

Characteristics of subjects by survival stage

Table 1 shows the characteristics of the study subjects. The age group of the 40s had the most subjects (42.2%), and 91.2% of the subjects were women. Significant differences by survival stage were found in age, online community access, surgical scope, recurrence experience, and the number of radioactive iodine treatments received. In the acute stage, the percentage of patients accessing the online community daily was the highest (68%). In the permanent stage, 20.0% of people were in their 60s or older, which was a higher age than in the other survival stages; 38.9% of respondents underwent a lateral resection and reoperation, and 15.8% experienced a recurrence. In the acute stage, 4.1% patients received radioactive iodine treatment more than twice, whereas in the extended stage it was 21.4%, and in the permanent stage, it was 31.6%.

Health-promoting behavior, social support, self-efficacy, fear of recurrence, and symptoms

The total score for health-promoting behavior was 101.32 ± 15.09 , and the average item score was 2.67 ± 0.40 . In the sub-areas of health-promoting behavior, the score for health responsibility was highest at 2.83 ± 0.39 points, and the score for exercise was the lowest at 2.36 ± 0.77 points (Table 2).

Differences in health-promoting behavior, social support, self-efficacy, fear of recurrence, and symptoms by survival stage

The scores with significant differences by survival stage were social support and fear of recurrence. The social support score was 46.69 ± 9.15 points in the extended stage, which was significantly higher than the 43.59 ± 10.26 points in the permanent stage. The fear of recurrence was 42.52 ± 10.27 points in the acute stage, which was significantly higher than the 38.63 ± 11.73 points in the permanent stage (Table 3).

Among the symptoms, the fatigue score was highest at 5.56 ± 2.69 points, and it did not differ significantly by survival stage.

Performance of health-promoting behavior by subject characteristics, social support, self-efficacy, symptoms, and fear of recurrence

The overall score for engaging in health-promoting behavior was significantly higher in the subjects who had more than 2 radioactive iodine treatments than in subjects who had 1 treatment (Table 4).

The performance of health-promoting behaviors among thyroid cancer patients correlated significantly with social support, self-efficacy, symptoms, and fear of recurrence (Table 5).

Factors of health-promoting behavior by survival stage

The factors affecting health-promoting behavior in the acute stage were self-efficacy and social support. In the extended stage, symptoms, social support, fear of recurrence, and the number of radioactive iodine treatments significantly affected health-promoting behavior. In the permanent stage, self-efficacy, social support, the number of radioactive iodine treatments, and age significantly affected health-promoting behavior (Table 6).

Discussion

Health-promoting behaviors of thyroid cancer survivors

The average score for health-promoting behaviors among thyroid cancer patients was 2.67/4.00. Among the sub-areas of health-promoting behavior reported by thyroid cancer survivors in this study, exercise was the lowest at 2.36 points, and stress management was the second lowest at 2.46 points. This was similar to the findings among breast cancer patients, whose scores were lowest for stress management and second lowest for exercise [27]. Thyroid cancer survivors are considered to have a low score in the exercise area because the proportion of women in that population is three times higher than that of men [28]. In the study of patients with colorectal cancer, women reported having lower physical activity than men [29]. In addition, the results of previous comparisons of the degree of exercise between cancer patients and healthy adults show that cancer patients do not exercise regularly [30].

The proportion of thyroid cancer patients in Korea is 53.1% in their 40s and 50s, and 57.9% of the thyroid cancer survivors in this study reported having a job [28]. In fact, patients with thyroid cancer are reported to have a shorter leave of absence and lower unemployment rate than patients with other types of cancer [31]. Therefore, exercise interventions that can accommodate work life are needed for survivors in their 40s and 50s. Women in their 40s and 50s who have survived thyroid cancer need to take steps to prevent osteoporosis in preparation for menopause because taking thyroid hormones raises the risk of osteoporosis [32]. Therefore, it is necessary to develop an exercise program for preventing osteoporosis that thyroid cancer survivors can follow easily at home.

Factors influencing health-promoting behavior by survival stage

The factors affecting the use of health-promoting behavior among thyroid cancer survivors differed by survival stage. Fear of recurrence and symptoms influenced health-promoting behavior only in the extended stage, and age was associated with health-promoting behavior only in the permanent stage.

Social support was found to be a variable influencing health-promoting behavior in all stages of survival, and social support was low in the permanent stage.

The acute stage is a period of active treatment, and it is necessary to promote self-efficacy and encourage health-promoting behavior through social support. A cancer diagnosis can be a motivation to change health behaviors [33]. Motivation is important in changing health behaviors, so it is important to strengthen motivation in the early stages [34, 35]. In the acute stage, medical staffs should learn about each patient's health behaviors and plan for change with them together.

As survivors at the extended stage return to work after finishing treatment, they engage in relatively fewer health-promoting behaviors, so active education is needed to strengthen their commitment to health-promoting behavior [36]. As shown by this study, in the extended stage, it is necessary to focus on managing the symptoms and fear of recurrence caused by radioactive iodine treatment. In this study, high symptom scores dose-dependently correlated with low health-promoting behavior scores. Previous studies also found that physical symptom experience reduced health-promoting behavior [12]. A study of health-promoting behavior among middle-aged women found that more severe menopausal symptoms correlated with low health-promoting behavior [37]. Patients with thyroid cancer need continuous intervention for their symptoms because fatigue persists for a long time after treatment [38]. The results of this study also show that in the extended stage, symptoms interfere with health promotion. Nurses should thus help patients acquire skills to cope with symptoms, such as fatigue, that interfere with health promotion and provide positive feedback to encourage them to continue their health behaviors.

Among thyroid cancer survivors in the extended stage, a high fear of recurrence correlated with a high use of health-promoting behaviors. This is a principle of the health belief model, which is based on an awareness of the risks of disease and the value of preventive health behavior [11]. However, fears of recurrence need to be approached carefully because a high fear of recurrence carries a high level of patient anxiety [24]. Previous studies have shown that providing information about benefits more effectively motivates health behaviors than focusing on potential losses [39]. Therefore, the fear of recurrence needs to lead to effective health behavior through an emphasis on the benefits of health behavior and accurate information. Providing a variety of health promotion programs could help patients overcome the fear of recurrence.

Patients with thyroid cancer who have received radioactive iodine treatment more than once reported high health-promoting behavior scores in this study, which is consistent with higher health-promoting behavior scores in breast cancer patients who received chemotherapy [27]. In a previous study, the severity of disease awareness in patients with thyroid cancer correlated with the number of radioactive iodine treatments, and patients who received radioactive iodine treatment more than once were thought to have attempted to improve their health by recognizing the severity of their disease [40].

A program for continuous health promotion should be developed for patients in the permanent stage of survival, with interventions offered to increase self-efficacy and social support. Stages of thyroid cancer are divided according to age, and at diagnosis, patients over 55 years of age have a higher cancer stage

and a worse prognosis [41]. Among respondents in the permanent stage, health-promoting behavior was high in survivors older than 60, possibly because they perceived the risk of thyroid cancer. Therefore, education is needed to encourage health-promoting behavior among survivors in their 40s and 50s. The number of online users in their 40s and 50s is high, and in this study, 54% of respondents said that they accessed the online community every day [42]. In recent years, e-health applications and healthcare education using mobile phones have been spotlighted and reported to have positive effects [43, 44]. In the permanent stage of survival, intervals between outpatient visits are long, so it would be helpful to develop an online healthcare program to provide disease-related information and encourage regular exercise.

This study has confirmed that self-efficacy and social support are factors that influence health promotion, as shown in Pender's health promotion model, and that the fear of recurrence and symptoms also influence cancer survivors' participation in health-promoting behaviors. With the development of medical technology and improvements in the long-term cancer survival rate, cancer is becoming a disease that requires long-term management. Interventions that vary with the stage of survival will help to improve the use of health-promoting behavior among cancer survivors.

Limitations

Most of the data collected in this study came from patients who responded through the online community, and it is difficult to rule out the possibility that people who frequently access the online community work harder to promote health than those who access the online community less often or not at all. In addition, this study compared groups of thyroid cancer survivors in the acute, extended, and permanent survival stages, and the characteristics of those groups might have differed in meaningful ways. Because this study was cross-sectional, it did not consider the passage of time. Therefore, interpretations should be made with care when comparing the three groups. In the future, longitudinal cohort studies are needed to identify changes in health-promoting behavior.

Conclusion

Factors influencing the health-promoting behavior of thyroid cancer survivors differed in each survival stage. Therefore, interventions that can promote appropriate health behaviors should be developed to reflect the characteristics of each survival stage. It is necessary to strengthen the management of survivors not only at the acute stage, but also in the extended and permanent stages.

Declarations

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Conflict of interest The authors declare no conflicts of interest, financial or other, exists.

Data availability The authors confirmed that some access restrictions apply to the data underlying the findings. The data from this research study cannot be shared publicly available due to concerns of participant confidentiality. If there is a researcher who wants to receive the data of this study, contact the corresponding author (sangheekim@yuhs.ac). Data are available from the Gangnam Severance Hospital Ethics Committee for researchers who meet the criteria for access to confidential data.

Author's contributions:

Kyung Ah Park (KAP), Sanghee Kim (SK), Eui Geum Oh (EGO), Heejung Kim (HK), Hang-Seok Chang(HSC), and Soo Hyun Kim(SHK) contributed to this research as following:

KAP, SK designed the research, wrote the proposal and the draft of IRB approval form. KAP, HSC collected the data and coded it. KAP, HK, & SHK did analyzed the data and report it. KAP, SK, EGO, HK, HSC, & SHK reviewed the proposal, results, the first draft of manuscript and corrected.

Ethics approval This study was approved by the Institutional Review Board of Younsei University Gangnam Severance Hospital (IRB No. 2019-0619-003).

Consent to participate: Not applicable

Consent to publication: Not applicable

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Tables

Table 1. Characteristics of Thyroid Cancer Survivors By Survival Stage

Characteristics	Categories	Total (<i>n</i> =354)	Acute survival (<i>n</i> =147)	Extended survival (<i>n</i> =112)	Permanent survival (<i>n</i> =95)	χ^2	<i>p</i>
		<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)		
Age (years)							
	< 40	96 (27.2%)	46 (31.5%)	37 (33.0%)	13 (13.7%)	28.82	<.001
	40-49	149 (42.2%)	60 (41.1%)	49 (43.8%)	40 (42.1%)		
	50-59	77 (21.8%)	34 (23.3%)	20 (17.9%)	23 (24.2%)		
	≥60	31 (8.8%)	6 (4.1%)	6 (5.4%)	19 (20.0%)		
Gender							
	Men	31 (8.8%)	13 (8.8%)	10 (8.9%)	8(8.4%)	0.02	.991
	Women	323 (91.2%)	134 (91.2%)	102 (91.1%)	87(91.6%)		
Marital status							
	Married	291 (82.2%)	117 (79.6%)	94 (83.9%)	80(84.2%)	1.18	.556
	Single	63 (17.8%)	30 (20.4%)	18 (16.1%)	15 (15.8%)		
Education							
	≤High school	78 (22.0%)	27 (18.4%)	26 (23.2%)	25(26.3%)	2.26	.324
	≥College	276 (78.0%)	120 (81.6%)	86 (76.8%)	70(73.7%)		
Monthly income							
(10,000 won)	<200	19 (5.4%)	8 (5.5%)	6 (5.4%)	5 (5.3%)	3.36	.763
	200– <400	100 (28.4%)	44 (30.1%)	26 (23.2%)	30 (31.9%)		
	400– <600	118 (33.5%)	51 (34.9%)	40 (35.7%)	27 (28.7%)		
	≥600	115	43	40	32 (34.0%)		

		(32.7%)	(29.5%)	(35.7%)			
Employment status							
	Employed	205 (57.9%)	85 (57.8%)	71 (63.4%)	49(51.6%)	2.94	.229
	Not employed	149 (42.1%)	62 (42.2%)	41 (36.6%)	46(48.4%)		

Table 1. Characteristics of Thyroid Cancer Survivors By Survival Stage (*Continued*)

Characteristics	Categories	Total (n=354) n (%)	Acute survival (n=147) n (%)	Extended survival (n=112) n (%)	Permanent survival (n=95) n (%)	χ^2	<i>p</i>
Frequency accessing							
online community	Every day	191 (54.0%)	100 (68.0%)	46 (41.1%)	45 (47.4%)	29.42	<.001
	2–3 times a week	80 (22.6%)	29 (19.7%)	31 (27.7%)	20 (21.1%)		
	2–3 times a month	57 (16.1%)	11 (7.5%)	28 (25.0%)	18 (18.9%)		
	Rarely accessed	26 (7.3%)	7 (4.8%)	7 (6.3%)	12 (12.6%)		
Cancer type							
	Papillary	338 (95.5%)	143 (97.3%)	104 (92.9%)	91(95.8%)	2.91	.234
	Other ¹	16 (4.5%)	4 (2.7%)	8 (7.1%)	4 (4.2%)		
Extent of surgery							
	Less-than- total ²	150 (42.5%)	76 (52.1%)	47 (42.0%)	27(28.4%)	17.53	.002
	Total thyroidectomy	112 (31.7%)	43 (29.5%)	38 (33.9%)	31(32.6%)		
	Other ³	91 (25.8%)	27 (18.5%)	27 (24.1%)	37(38.9%)		
Cancer recurrence							
	Yes	28 (7.9%)	6 (4.1%)	7 (6.3%)	15(15.8%)	11.48	.003
	No	326 (92.1%)	141 (95.9%)	105 (93.8%)	80(84.2%)		
Number of I ¹³¹ therapies							
	None	181 (51.1%)	96 (65.3%)	56 (50.0%)	29(30.5%)	42.91	<.001
	1 time	113 (31.9%)	45 (30.6%)	32 (28.6%)	36(37.9%)		
	≥2 times	60	6 (4.1%)	24	30 (31.6%)		

(16.9%)

(21.4%)

¹ Other includes follicular cancer, Hurthle cell cancer, medullary cancer, poorly differentiated cancer, and anaplastic cancer.

² Less-than-total includes less-than-total thyroidectomy and hemithyroidectomy.

³Other includes total thyroidectomy along with lateral neck dissection and re-operation.

Table 2. Levels of Health-promoting Behavior, Social Support, Self-efficacy, Fear of Recurrence, and Symptoms

Variables	M±SD	Range	Item M±SD	Item range
Health-promoting behavior	101.32±15.09	63-144	2.67±0.40	1-4
Self-realization	18.68±3.76	9-28	2.67±0.54	1-4
Health responsibility	31.23±4.25	19-44	2.83±0.39	1-4
Physical activity	9.42±3.08	4-16	2.36±0.77	1-4
Nutrition	13.21±2.87	6-20	2.64±0.57	1-4
Interpersonal relations	14.01±2.86	5-20	2.80±0.57	1-4
Stress management	14.77±3.48	6-23	2.46±0.58	1-4
Social support	45.61±9.91	16-60	3.80±0.83	1-5
Family	15.90±3.76	4-20	3.96±0.94	1-5
Friends	14.15±3.92	4-20	3.54±0.98	1-5
Significant others	15.56±3.61	4-20	3.89±0.90	1-5
Self-efficacy	64.20±17.23	10-100	6.42±1.72	1-10
Fear of recurrence	40.79±10.78	12-60	3.40±0.90	1-5
Symptoms	55.80±29.11	0-134	3.49±1.82	0-10

Table 3. Differences in Health-promoting Behavior, Social Support, Self-efficacy, Fear of Recurrence and Symptoms By Survival Stage

Variables	Total (<i>n</i> =354)	Acute survival ^a (<i>n</i> =147)	Extended survival ^b (<i>n</i> =112)	Permanent survival ^c (<i>n</i> =95)	F(<i>p</i>)
	M±SD	M±SD	M±SD	M±SD	
Health-promoting behavior	101.32±15.09	100.75±15.15	102.11±13.96	101.26±16.33	0.26(.773)
Self-realization	18.68±3.76	18.24±3.94	19.28±3.38	18.66±3.83	2.45(.088)
Health responsibility	31.23±4.25	31.36±4.34	31.14±4.28	31.15±4.13	0.11(.896)
Physical activity	9.42±3.08	9.37±3.01	9.23±2.86	9.69±3.43	0.60(.549)
Nutrition	13.21±2.87	13.14±2.73	13.26±3.11	13.25±2.82	0.07(.936)
Interpersonal relations	14.01±2.86	13.87±3.04	14.21±2.47	13.98±3.02	0.44(.645)
Stress management	14.77±3.48	14.76±3.37	14.99±3.50	14.53±3.64	0.46(.634)
Social support	45.61±9.91	45.89±10.08	46.96±9.15	43.59±10.26	3.10(.046) ^{b>c}
Family	15.90±3.76	16.01±3.87	16.34±3.47	15.22±3.87	2.40(.092)
Friends	14.15±3.92	14.14±4.08	14.43±3.75	13.83±3.88	0.60(.552)
Significant others	15.56±3.61	15.74±3.53	16.19±3.37	14.54±3.81	5.86(.003) ^{a,b>c}
Self-efficacy	64.20±17.23	64.31±17.81	64.53±13.61	63.64±20.08	0.72(.930)
Fear of recurrence	40.79±10.78	42.52±10.27	40.35±10.30	38.63±11.73	3.95(.020) ^{a>c}
Symptoms	55.80±29.11	56.08±28.59	53.20±28.53	58.42±30.61	0.84(.433)

^{a,b,c}: Tukey HSD test

Table 4. Health-promoting Behavior According to the Characteristics of Thyroid Cancer Survivors

(*N*=354)

Characteristics	Categories	Health-promoting behavior	
		M ± SD	F/t (p)
Age (years)	< 40	100.97±13.01	
	40-49	101.48±14.59	2.52
	50-59	98.82±16.89	(.058)
	≥60	107.55±17.56	
Gender	Men	100.29±16.07	-0.40
	Women	101.41±15.01	(.692)
Marital status	Married	101.33±15.05	0.03
	Single	101.27±15.37	(.978)
Education	≤High school	102.14±15.98	0.55
	≥College	101.08±14.85	(.585)
Monthly income (10,000 won)	<200	101.21±15.97	
	200– <400	98.47±14.04	1.96
	400– <600	101.35±14.91	(.120)
	≥600	103.42±15.59	
Employment status	Employed	101.12±15.16	-0.29
	Not employed	101.59±15.03	(.771)
Frequency of accessing online community	Every day	101.92±14.87	
	2–3 times a week	100.64±16.92	0.73
	2–3 times a month	99.19±14.53	(.533)
	Rarely accessed	103.62±11.59	

Table 4. Health-promoting Behavior According to the Characteristics of Thyroid Cancer Survivors
(Continued)

(N=354)

Characteristics	Categories	Health-promoting behavior	
		M ± SD	F/t (p)
Cancer type	Papillary	101.18±15.11	-0.78
	Other ¹	104.19±14.64	(.437)
Extent of surgery	Less-than-total ²	101.43±14.78	0.41
	Total thyroidectomy	100.34±14.98	(.665)
	Other ³	102.24±15.86	
Cancer recurrence	Yes	105.07±13.94	1.37
	No	100.99±15.16	(.170)
Number of I ¹³¹ therapies	None ^a	101.76±14.66	3.29
	1 time ^b	98.78±15.21	(.039)
	≥2 times ^c	104.77±15.53	b<c

¹ Other includes follicular cancer, Hurthle cell cancer, medullary cancer, poorly differentiated cancer, and anaplastic cancer.

² Less-than-total includes less-than-total thyroidectomy and hemithyroidectomy.

³ Other includes total thyroidectomy along with lateral neck dissection and re-operation.

^{a,b,c}: Tukey HSD test

Table 5. Correlations Among Health-promoting Behavior, Social Support, Self-efficacy, Symptoms, and Fear of Recurrence

Variables	Health-promoting behavior	Social support	Self-efficacy	Symptoms	Fear of recurrence
	<i>r (p)</i>	<i>r (p)</i>	<i>r (p)</i>	<i>r (p)</i>	<i>r (p)</i>
Health-promoting behavior	1				
Social support	.46 ($<.001$)	1			
Self-efficacy	.51 ($<.001$)	.47 ($<.001$)	1		
Symptoms	-.29 ($<.001$)	-.23 ($<.001$)	-.34 ($<.001$)	1	
Fear of recurrence	-.13 (0.016)	-.07 (0.186)	-.40 ($<.001$)	.25 ($<.001$)	1

(*N*=354)

Table 6. Factors of Health-promoting Behavior By Survival stage

Variables	Categories	Acute	Extended	Permanent
		Stage (<i>n</i> =147) β (<i>p</i>)	Stage (<i>n</i> =112) β (<i>p</i>)	Stage (<i>n</i> =95) β (<i>p</i>)
Social support		.30 (.001)	.25 (.011)	.26 (.007)
Self-efficacy		.43 (<.001)	.17 (.124)	.42 (<.001)
Fear of recurrence		.03 (.676)	.21 (.032)	.09 (.358)
Symptoms		-.03 (.662)	-.34 (<.001)	-.11 (.219)
Number of I ¹³¹ therapies (ref: \geq 2 times)	None	-.15 (.391)	-.21 (.067)	-.06 (.535)
	1 time	-.16 (.337)	-.25 (.032)	-.29 (.002)
Age (years) (ref: \geq 60)	< 40	-.09 (.561)	-.32 (.102)	-.14 (.151)
	40-49	-.08 (.636)	-.36 (.087)	-.30 (.007)
	50-59	-.06 (.687)	-.15 (.357)	-.24 (.018)
Monthly income (10,000 won) (ref: \geq 600)	< 200	.07 (.349)	.01 (.954)	-.04 (.648)
	200- <400	.01 (.874)	.15 (.183)	-.08 (.407)
	400- <600	.05 (.530)	.02 (.857)	-.01 (.925)
Employment status (ref: Not employed)	Employed	-.04 (.585)	.14 (.117)	.14 (.082)