

RESEARCH ARTICLE

Body Misperception and Its Associated Factors among Cancer Survivors in Korea

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Abstract

Background: As the number of cancer survivors is increasing, the importance of their healthcare management is becoming emphasized. For this purpose, appropriate recognition of the importance of body weight is necessary. This study concerned misconceptions about body weight and related factors among cancer patients. **Methods:** This cross-sectional study involved 1,159 participants who participated in the 2007-2012 Korean National Health and Nutrition Examination Survey. Self-reported questionnaires were used to assess cancer information, socioeconomic status, health behavior, and psychological factors. **Results:** Men had a higher rate of underestimation and a lower rate of overestimation of body weight than women (34.7% vs. 22.9%; 10.9% vs. 15.5%, respectively). Underestimation of body weight was positively associated with a self-assessment of being in poor health in men (OR 2.44, 95% CI 1.58-3.75) and in elderly women (OR 3.70, 95% CI 2.44-5.23). Overestimation of body weight was positively associated with depression in men (OR 2.17, 95% CI 1.01-4.63) and a high educational level/high-income level and having tried to control weight in women (OR 1.92, 95% CI 1.16-3.18; OR 1.57, 95% CI 1.00-2.47; OR 3.24, 95% CI 1.82-5.77, respectively). **Conclusions:** Higher socioeconomic status (SES), depression, self-rated health status, age, and weight control trials were found to be associated with underestimation and overestimation of body weight in cancer survivors. From this study, it is evident that more efforts are needed to remove misperceptions and to develop healthy behavior for cancer survivors by various means.

Keywords: Body image- body mass index- cancer survivor- misperception

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Introduction

The number of cancer survivors has increased in recent years, mainly due to active cancer screening and advanced technologies for cancer treatment, resulting in increased incidence of cancer and decreased cancer mortality (Lim et al., 2015; Oh et al., 2016). The importance of health care management for cancer survivors has been emphasized not only for prevention of recurrence and secondary primary cancer, but also improvement in quality of life (Denlinger et al., 2014; Denlinger et al., 2014; Park et al., 2016). Cancer patients are exposed to vulnerable environments of weight gain or weight loss from multiple causes such as cancer treatment (chemotherapy, hormonal therapy, and steroid use), physical inactivity, cachexia, malnutrition, depression and stress (Greenlee et al., 2016). Statements from the American Society of Clinical Oncology have also advised that knowing the current weight status and guidance on weight management for cancer patients are recommended in order to reduce the burden of cancer (Ligibel et al., 2014).

There have been several studies on changes in body

weight and the personal misconceptions about it related to depression, stress, self-rated health status and low socioeconomic status (Boo, 2014; Choi et al., 2015). However, most of these studies have been on adolescents, young adults or people without disease. To our knowledge, there has been no study on body misconception among cancer survivors. Proper recognition of the current state of obesity or underweight is a starting point in maintaining a healthy lifestyle including having proper nutrition and performing appropriate exercise. Therefore, we investigated misconception in body weight and its related factors among cancer patients using a nationally representative data collected in South Korea.

Materials and Methods

Study population

This study is based on the Korean National Health and Nutrition Examination Survey (KNHANES), performed by Centers for Disease Control & Prevention. KNHANES is a nationwide representative study, performed to date in six phases: phase I (1998), II (2001), III (2005), IV

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(2007–2009), V (2010–2012), and VI (2013–2014). This survey used a stratified, multistage probability sampling design for the selection of household units. In order to represent the entire Korean adult population, sampling weights were used to account for the complex sampling, which included stratification by district in the first step and stratification by sex and age in the second step. The survey consisted of the Health Interview Survey, the Health Behavior Survey, the Nutrition Survey and the Health Examination Survey, and the patients were evaluated with self-administered questionnaires. Interviewers assisted the participants who had difficulty with self-administration. Written informed consent for using their data in further analyses was provided by all participants who were given the option of exercising their right to refuse to participate in accordance with the National Health Enhancement Act.

We performed cross-sectional analyses of data from 37,604 people in KNHANES IV (2007–2009) and V (2010–2012) who participated in the Health Interview Survey and the Health Examination Survey. Of these, 1,159 people (414 men and 745 women) who were diagnosed with cancer and there was information on their body mass index and subjective perception of body weight were finally included in our study. The Institutional Review Board (IRB) of the Korea Centers for Disease Control and Prevention approved this study.

Definition of a cancer survivor

Cancer prevalence was questioned by “have you ever had stomach cancer in your life?” and the same question was asked about liver, colon, breast, cervical, lung, thyroid and other cancers. The people who answered “yes” were included in the analysis and answered “no” were ruled out in the final analysis.

Definition of body weight misconception (overestimation and underestimation) and having the right recognition

Physical examinations were performed by trained medical staff following standardized procedures. Body weight and height were measured to the nearest 0.1 kg and 0.1 cm, respectively, with subjects wearing light indoor clothing without shoes. BMI was calculated as the ratio of weight in kilograms to height in meters squared (kg/m^2). According to the Asia-Pacific regional guidelines of the WHO and International Obesity Task Force (IOTF), we defined the cutoff points for underweight, normal weight and obesity as a BMI of 18.5 kg/m^2 , and 25 kg/m^2 or higher, respectively (International Obesity Task Force and World Health Organization, 2000). There was also a question on subjective body weight perception in KNHANES IV and V: “What is your body image?”

Underestimation was defined as normal weight people who perceived to be underweight or obese people who perceived to be of normal weight or being underweight. The right recognition was defined as underweight people who perceived being underweight or normal weight people who perceived being of normal weight or obese people who perceived being obese themselves. Overestimation was defined as underweight people who perceived having normal weight or being obese, and similarly, normal weight people who thought they were obese.

Definition of socioeconomic status, health behavior factors, and psychological factors

The self-administered questionnaire in the Health Interview Survey was used to gather information on socioeconomic factors (age, gender, residential area, education level, household monthly income, marital status), health behavior factors (smoking status, alcohol drinking, exercised, health check-up, weight control trial), and psychological factors (self-health status, stress, depression). Residential area was divided into “urban” and “rural.” Education level was classified into “high school or higher” and “middle school or lower.” According to household income, participants answered an open-ended question on income: “What is your average monthly income including salaries, property income, pension, government subsidies, and allowance?” The Ministry of Health and Welfare classified individuals into four groups (lowest, middle-lowest, middle-highest, and highest) according to monthly household income. Our study divided two household income categories such as “less than average,” which includes the lowest and middle-lowest or “more than average,” which includes middle-highest, and highest. Marital status was divided into “married” and “unmarried,” which included “single” and “divorced/separated/widowed.”

Smoking status was categorized into “current smoker” and “past/non-smoker” including ex-smoker and never-smoker. “Current smoker” category included those who smoked regularly or intermittently. Data on having no excessive alcohol consumption (<3 standard drinks [StDs] per occasion) or having excessive alcohol consumption (≥ 3 StDs per occasion) were also collected by the self-reporting questionnaire. Adequate physical activity ($\geq 3,000$ metabolic equivalent [MET]-min/week) or inadequate physical activity ($<3,000$ MET-min/week) data were also collected after summation of walking, moderate and vigorous MET minutes/week scores (Abu-Omar and Rutten, 2008). Participants answered questions regarding health check-ups, such as, “Have you undergone a health check-up within the last 2 years?” with participants answering “yes” or “no.” Weight control trial was defined with the question, “Have you ever tried to control your weight on purpose for the last year?” with a response of “yes” or “no.”

Two categories of self-rated health status were included: excellent/good/fair were included in the “not bad” category and poor/very poor were included in the “bad” category after the question of “Usually what do you think of your health status?”. Stress was identified by asking, “How much do you feel stress in daily life?” and answered with a “yes” when stress was very much, much, or a little and answered with a “no” when stress was rarely felt. Depression was evaluated by asking, “Have you felt sad, unhappy or desperate for more than two weeks, which interfered with the daily activities during the past one year?”.

Statistics analysis

Statistical analyses were performed based on presence of body misconception and having the right recognition. Descriptive statistical methods including chi-square test

were used to describe the basic characteristics of the study population and the numbers and percentages were reported for each variable. Logistic regression analyses were used to calculate the odds ratio and 95% confidence intervals in each multivariate factor with adjusting age and body mass index by the group for body misconception including underestimation and overestimation. All analyses were conducted using SAS, version 9.2 (SAS Institute Inc., Cary, NC, USA). All statistical tests were two-sided and statistical significance was determined at p-value <0.05.

Results

Basic characteristics of the study population are listed in Table 1. The number (percentage) of body misconception and having the right recognition were 473 (41.0 %) and 682 (59.0%) of the study participants, respectively. The higher rate of old age and the lower rate of obesity were in body misconception compared to right recognition (63.9% vs. 55.9%, 16.9% vs. 39.0%, respectively). Men had higher rate of body misperception than women (45.6% vs. 38.4%). The rate of having the self-rated health status of “bad” was higher in the body misconception compared to the right recognition groups (47.4% vs. 38.0%).

The rates of underestimation and overestimation were 34.7% and 10.9% in men, respectively; those rates were 22.9% and 15.5% in women, respectively (Figure 1). The rates of overestimation among underweight people were 5.7% in men and 7.4% in women, and the rates of overestimation among normal weight people were 14.4% in men and 25.2% in women. The rates of underestimation among normal weight people were 39.9% in men and 25.4% in women, and the rates of underestimation among obese people were 30.4% in men and 21.0% in women (Figure 2A and 2B).

Table 2 presents the factors associated with body misconception in male cancer survivors. People with a higher education showed lower OR of underestimation (OR 0.45, 95% CI 0.28-0.71) and the people with self-rated health status of “bad” had higher OR of underestimation, (OR 2.44, 95% CI 1.58-3.75). The group

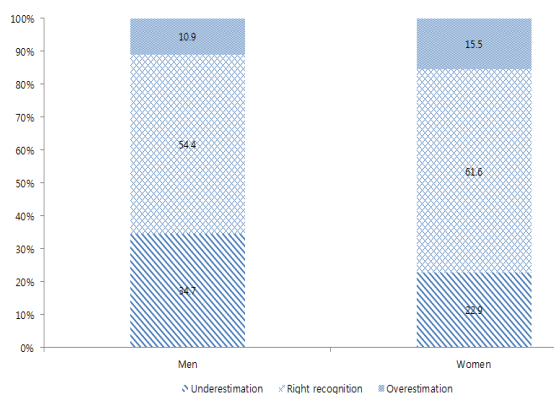


Figure 1. The Rate of Underestimation, Right Recognition, and Overestimation of Body Weight in Men and Women

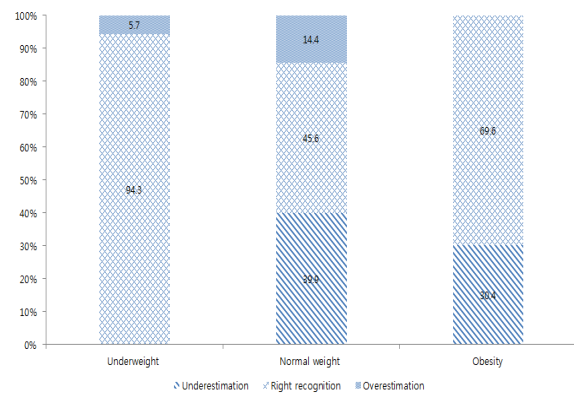


Figure 2A Men. The Rate of Underestimation, Right Recognition, and Overestimation of Body Weight by Obesity Categories in Men and Women

of having depression had higher OR of overestimation (OR 2.17, 95% CI 1.01-4.63).

Table 3 shows the factors associated with body misconception in female cancer survivors. Participants with old age had higher odds ratio (OR) of underestimation (OR 3.70, 95% CI 2.44-5.23) and the participants with a high education and a high income level showed lower ORs of underestimation (OR 0.48, 95% CI 0.30-0.79; OR 0.62, 95% CI 0.42-0.94, respectively). The group that had tried weight control had lower OR of underestimation (OR 0.60, 95% CI 0.41-0.89). The old-age group had lower OR for overestimation (OR 0.24, 95% CI 0.15-0.38) and the group with a high educational level and a high-income level had a higher OR for overestimation (OR 1.92, 95% CI 1.16-3.18; OR 1.57, 95% CI 1.00-2.47, respectively). The participants that had tried weight control had higher ORs for overestimation (OR 3.24, 95% CI 1.82-5.77).

Discussion

Our study presented the current status of body misconception among Korean cancer survivors and its associated factors. Men had a higher rate of underestimation and a lower rate of overestimation than women. Underestimation of body weight was negatively associated with having attained a high educational level

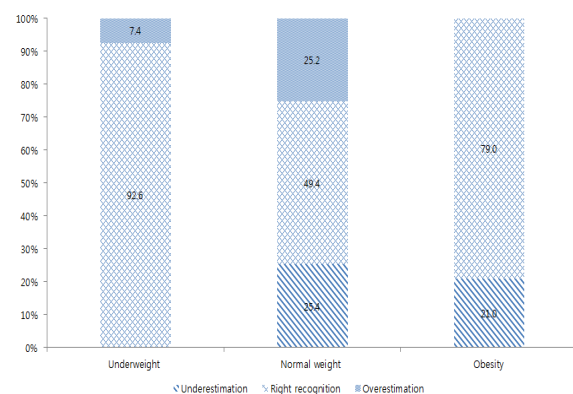


Figure 2B. Women. The Rate of Underestimation, Right Recognition, and Overestimation of Body Weight by Obesity Categories in Men and Women

Table 1. Basic Characteristics of Study Population

	Body misconception (N=473)	Right recognition (N=682)	P value*
Age (yr)			
20-60	171 (36.2)	301 (44.1)	0.007
≥60	302 (63.9)	381 (55.9)	
Sex			
Men	188 (45.6)	224 (54.4)	0.016
Women	285 (38.4)	458 (61.6)	
Body mass index			
<25	393 (83.1)	416 (61.0)	<0.001
≥25	80 (16.9)	266 (39.0)	
Socioeconomic status factors			
Residence			
Rural	142 (30.0)	181 (26.5)	0.19
Urban	331 (70.0)	501 (73.5)	
Education			
≤Middle school	292 (61.7)	385 (56.5)	0.08
≥High school	181 (38.3)	296 (43.5)	
House Income			
Lesser than average	270 (58.3)	361 (54.0)	0.15
More than average	193 (41.7)	308 (46.0)	
Marital status			
No	12 (2.5)	14 (2.1)	0.59
Yes	461 (97.5)	668 (97.9)	
Health behavior factors			
Smoking			
No, past	431 (91.3)	619 (90.9)	0.81
Current	41 (8.7)	62 (9.1)	
Alcohol			
No	217 (70.7)	374 (73.9)	0.31
Yes	90 (29.3)	132 (26.1)	
Physical activity			
MET<3000	329 (74.4)	479 (74.6)	0.95
MET>3000	113 (25.6)	163 (25.4)	
Health check-up			
No	87 (35.1)	151 (37.5)	0.54
Yes	161 (64.9)	252 (62.5)	
Weight control trial			
No	208 (44.0)	262 (38.4)	0.06
Yes	265 (56.0)	420 (61.6)	
Psychological factors			
Self-rated health status			
Not bad	249 (52.6)	423 (62.0)	0.002
Bad	224 (47.4)	259 (38.0)	
Stress			
No	103 (21.8)	137 (20.1)	0.49
Yes	370 (78.2)	544 (79.9)	
Depression			
No	362 (76.5)	550 (80.8)	0.08
Yes	111 (23.5)	131 (19.2)	

Table 1. Continued

	Body misconception (N=473)	Right recognition (N=682)	P value*
Cancer related information			
Cancer type			
Stomach	115 (23.3)	119 (24.1)	
Liver	19 (3.8)	20 (4.0)	
Colon	49 (9.9)	65 (13.2)	
Breast	54 (10.9)	101 (20.4)	
Cervical	53 (10.7)	92 (18.6)	
Lung	17 (3.4)	25 (5.0)	
Thyroid	38 (7.7)	67 (13.6)	
Others	149 (30.2)	228 (46.2)	

*Chi-square test

in men and women, a high-income level and having tried weight control in women. Underestimation of body weight was positively associated with a self-rated health status of “bad” in men, and old age in women. Overestimation of body weight was negatively associated with old age in women, and positively associated with depression in men and a high educational level, a high-income level, and history of weight control trial in women.

These results are consistent with the previous studies, which have reported a different pattern of body perception by age and sex. Boo (2014)’s study showed young and middle-aged people tended to overestimate their body weight compared to old people, and men had a higher rate of underestimation (63.2% vs. 37.5%); women were also 3.6 times more likely to have a heavier weight perception than men in Korea. Bhnaji et al., (2011)’s study presented that obese or overweight people in Pakistan older than 40 years were associated with underestimation of their body weight. From Herbert et al., (2017)’s study in Australia, underestimation of body weight was related to old age, and men were twice more likely to underestimate their weight than women. Chang and Christakis (2003)’s study in US, Gregory et al., (2008)’s study in US, Monteagudo et al., (2015)’s study in Germany and Donath (2000)’s study in Australia also presented men having a higher rate of underestimation and women having a higher rate of overestimation of their body weight.

The reason for different insights on body weight according to age and sex might be explained as follows: people with old age are less concerned about their body weight and image than the younger folks, and they have a negative view on slimming down their figure as that would be associated with poverty and nutrition deficiency from a traditional point of view in Korea. Portions of the older population may think that becoming obese is a natural part of ageing, and thus they don’t think seriously about their weight (Arantxa et al., 2014). There is also a sex difference about conception of obesity. Men tend to think that obesity is related with having a high SES from traditional thinking and women are easy to think that obesity is related with low self-esteem. Because women are more sensitive to mass media and the fashion industry in pursuing a slim body type, they can become more easily stressed from

Table 2. Factors Associated with Body Misconception in Male Cancer Survivors

		Underestimation (N=143)		Overestimation (N=45)	
		Unadjusted	Adjusted*	Unadjusted	Adjusted*
Age (yr)	20-60	1	1	1	1
	≥60	1.79 (1.07-3.00)	1.49 (0.88-2.53)	1.23 (0.57-2.66)	1.47 (0.67-3.24)
Body mass index	<25	1	1		
	≥25	0.79 (0.47-1.34)	0.86 (0.50-1.47)		
Socioeconomic status factors					
Residence	Rural	1	1	1	1
	Urban	0.74 (0.48-1.14)	0.86(0.55-1.35)	0.87 (0.45-1.68)	0.74 (0.38-1.45)
Education	≤Middle school	1	1	1	1
	≥High school	0.39 (0.25-0.59)	0.45 (0.28-0.71)	2.06(1.09-3.89)	1.77 (0.90-3.51)
House Income	Lesser than average	1	1	1	1
	More than average	0.55 (0.35-0.85)	0.66 (0.41-1.06)	1.84(0.98-3.45)	1.74 (0.88-3.45)
Marital status	No	1	1	1	1
	Yes	1.06 (0.26-4.29)	0.72 (0.14-3.60)	0.98(0.12-7.98)	1.02 (0.10-10.7)
Health behavior factors					
Smoking	No, past	1	1	1	1
	Current	0.91 (0.53-1.56)	0.87(0.50-1.51)	1.01(0.45-2.25)	1.60 (0.46-2.42)
Alcohol	No	1	1	1	1
	Yes	1.06 (0.60-1.86)	1.12 (0.62-2.04)	0.86(0.41-1.83)	0.86 (0.36-1.80)
Physical activity	MET<3000	1	1	1	1
	MET>3000	1.32 (0.84-2.07)	1.39 (0.87-2.22)	0.81(0.39-1.68)	0.81 (0.39-1.68)
Health check-up	No	1	1	1	1
	Yes	0.69 (0.39-1.21)	0.73 (0.41-1.33)	2.81(1.02-7.71)	2.62 (0.95-7.27)
Weight control trial	No	1	1	1	1
	Yes	0.69 (0.46-1.04)	0.80 (0.52-1.22)	1.02(0.55-1.90)	0.94 (0.49-1.78)
Psychological factors					
Self-rated health status	Not bad	1	1	1	1
	Bad	2.86 (1.88-4.35)	2.44 (1.58-3.75)	0.90(0.47-1.70)	1.13 (0.58-2.19)
Stress	No	1	1	1	1
	Yes	0.93 (0.58-1.48)	0.87 (0.60-1.57)	0.91(0.45-1.83)	0.87 (0.42-1.81)
Depression	No	1	1	1	1
	Yes	1.42 (0.82-2.43)	1.26 (0.72-2.21)	1.88(0.90-3.93)	2.17 (1.01-4.63)

*Adjusted of age and body mass index

social and family sources in becoming more slim (Bhnaji et al., 2011; Yahia, et al., 2011). There trends seem to be similar for cancer patients and the general population.

Our study showed that high educational and high-income levels were associated with less underestimation and more overestimation of body weight, and that these associations were more prominent in women. Previous studies have reported varying results on correlations between socioeconomic factors and extent of body misperception. Boo (2014)'s study showed a similar result with this study that Koreans having a higher educational level and a higher income level were related to overestimation. However, from Bhnaji et al., (2011)'s study on obese and overweight people in Pakistan, there were no associated factors between SES and body misperception. The Australian study by Hebert showed that having a low

educational level and a lower income level was positively associated with underestimation (Herbert et al., 2017). In general, people with a high education level and a high income level have more ready access to appropriate and useful health information and also pay more attention to their health (Arantxa et al., 2014). For this reason, the right awareness of body perception can be associated with SES factors; however, the discrepancies among the previous studies can be explained due to differences in ethnicities, cultural, regional factors and having a diverse study population (Hendley et al., 2011). Social disparity associated with body misconception is an important issue in public health, which affects one's healthy behaviors and lifestyle (Lim and Wang, 2013); therefore, efforts to correct such misconception is needed using the results of these studies.

Table 3. Factors Associated with Body Misconception in Female Cancer Survivors.

		Underestimation (N=170)		Overestimation (N=115)	
		Unadjusted	Adjusted*	Unadjusted*	Adjusted*
Age (yr)	20-60	1	1	1	1
	≥60	3.26 (2.25-4.72)	3.70 (2.44-5.23)	0.24(0.15-0.39)	0.24 (0.15-0.38)
Body mass index	<25	1	1		
	≥25	0.84 (0.59-1.21)	0.70 (0.55-1.16)		
Socioeconomic status factors					
Residence	Rural	1	1	1	1
	Urban	0.74(0.51-1.07)	0.87 (0.58-1.30)	1.44(0.89-2.33)	1.01 (0.67-1.82)
Education	≤Middle school	1	1	1	1
	≥High school	0.35(0.23-0.52)	0.48 (0.30-0.79)	3.24(2.15-4.89)	1.92 (1.16-3.18)
House Income	Lesser than average	1	1	1	1
	More than average	0.48(0.34-0.69)	0.62 (0.42-0.94)	2.28(1.50-3.44)	1.57 (1.00-2.47)
Marital status	No	1	1	1	1
	Yes	2.25 (0.51-9.94)	1.06 (0.23-4.98)	0.32 (0.12-0.89)	0.87 (0.28-2.70)
Health behavior factors					
Smoking	No, past	1	1	1	1
	Current	0.84(0.34-2.08)	1.08 (0.42-2.78)	0.60 (0.18-2.00)	0.49 (0.14-1.70)
Alcohol	No	1	1	1	1
	Yes	0.94(0.54-1.66)	1.55 (0.84-2.88)	1.58 (0.89-2.82)	1.01 (0.54-1.88)
Physical activity	MET<3,000	1	1	1	1
	MET>3,000	0.80(0.52-1.23)	0.92 (0.58-1.45)	1.07(0.66-1.73)	0.89 (0.54-1.47)
Health check-up	No	1	1	1	1
	Yes	1.20 (0.73-1.99)	1.40 (0.81-2.40)	1.00(0.58-1.72)	1.00 (0.57-1.76)
Weight control trial	No	1	1	1	1
	Yes	0.38 (0.27-0.53)	0.60 (0.41-0.89)	4.05(2.36-6.94)	3.24 (1.82-5.77)
Psychological factors					
Self-rated health status	Not bad	1	1	1	1
	Bad	1.41 (1.00-1.99)	1.08 (0.74-1.57)	0.73(0.49-1.11)	0.93 (0.60-1.44)
Stress	No	1	1	1	1
	Yes	0.61(0.40-0.92)	0.75 (0.48-1.16)	2.14(1.14-4.01)	1.61 (0.84-3.09)
Depression	No	1	1	1	1
	Yes	1.25(0.85-1.85)	1.33 (0.88-2.02)	0.98(0.61-1.56)	0.95 (0.58-1.56)

The present study has reported that a “bad” self-health status is positively related to underestimation of body weight and depression is positively related to overestimation of body weight in men. There have been many studies on body misperception and psychological factors. Choi’s study showed a poor self-rated health status and having severe stress were positively related to body misperception in middle-aged women with normal weight (Choi et al., 2015). Kim et al., (2008) showed that study participants with body misperception of either underestimation or overestimation tended to have a depressed mood and unhealthy weight control behaviors. Moreover, several studies with adolescents presented body misperception being closely related to psychological disorders including suicidal behaviors, as the study subjects were more sensitive about their body image (Kim and Lee, 2010; Kim and So, 2014; Lim and Yang, 2013). Although the mechanism of such associations

was not made clear, a negative viewpoint on body image could be bridged by having negative psychological issues (Kim and Lee, 2010; Kim and So, 2014).

Body misperception in cancer survivors can be more closely associated with mental and physical health status compared to a normal population; this means that misperception would more strongly affect a cancer survivor’s health-related lifestyle. Underestimation of body weight is likely to be associated with subjective perception of having a poor appetite, fatigue, and general weakness and makes it possible not to receive adequate dietary supplements and wholesome food. Moreover, this predisposition causes obesity through unhealthy behaviors for gaining weight and having mental health issues such as stress and depression, as the perception is that one is underweight rather than being of a normal weight. Overestimation can also bring about insufficient nutrition, extreme energy depletion, and excessive physical exercise,

leading to an unhealthy lifestyle for cancer survivors (Marshall et al., 2012). Furthermore, these behaviors can also cause mental stress, depression, low self-esteem, social withdrawal, coupled with an eating disorder on the thought of being obese. All these factors negatively impact the quality of life and nutritional status (Marshall et al., 2012). Those who have had experiences of weight loss or weight gain due to multiple causes after cancer treatment are more prone to underestimation or overestimation, and proper weight awareness should be emphasized, possibly alleviating poor compliance and having no faith in cancer treatment, or having their mental health easily impacted by various factors.

Recently, cancer survivorship programs have been actively developed for prevention of recurrence and occurrence of secondary cancer, leading to improvement in quality of life. According to the National Comprehensive Cancer Network (NCCN) guidelines, proper weight management is recommended for obesity-related cancer patients such as for colorectal cancer, breast cancer, and prostate cancer (Denlinger et al., 2014a; Denlinger et al., 2014b). To maintain appropriate weight, the right recognition of body weight should be emphasized.

There are several reasons why the right recognition of body weight is important. First, the right weight recognition would be the first step in maintaining a healthy life style with the appropriate health behaviors in cancer survivors. Second, high effectiveness in quality of life changes following the right recognition can be achieved with weight loss or gain intervention. Third, for cancer survivors, being obese or underweight can be related to their disease; therefore, more efforts on extension of cancer treatment could be made possible by maintaining a healthy weight after the right recognition of body weight.

There were several limitations to this study. First, this was a cross-sectional study, which could not identify relationship causalities. Second, there was a selection bias as comparably healthier participants enrolled in the KNHANES survey, and for poor performance patients and in-hospital patients, participating in the study was more difficult. Third, measurement error in checking body weight and height can influence the calculation of BMI. Also, BMI level is known to change depending on the ratio of muscle mass to adipose tissue in our bodies. Therefore, the definition of obesity solely on the criterion of BMI can be misleading and can thus affect the conclusions drawn. Fourth, the method of cancer detection in our study was based on survey questions; therefore, recall bias might have existed. Moreover, there was not enough cancer-related information collected from the participants; these include information on tumor aggressiveness and tumor size, and the methods of cancer treatment, which might have been related to body weight and subjective perception of body image. Despite of these limitations, to our knowledge, this is the first study to examine body misperception among cancer survivors and its associated factors.

In conclusion, our study demonstrated that the current status of body misperception, socioeconomic status and mental health were related to body misperception in cancer survivors. These results can provide a guideline

to the need for weight management in cancer patients. Additional large studies are also needed to elucidate body misperception issues in cancer survivors, allowing to develop tailored intervention programs to modify misperception and to establish healthy behaviors among the cancer survivors.

References

- Abu-Omar K, Rutten A (2008). Relation of leisure time, occupational, domestic, and commuting physical activity to health indicators in Europe. *Prev Med*, **47**, 319-23
- Arantxa Colchero M, Caro-Vega Y, Kaufer-Horwitz M (2014). Socioeconomic status and misperception of body mass index among Mexican adults. *Salud Publica Mexico*, **56**, 251-8.
- Bhanji S, Khuwaja AK, Siddiqui F, et al (2011). Underestimation of weight and its associated factors among overweight and obese adults in Pakistan: a cross sectional study. *BMC Public Health*, **23**, 363.
- Boo S (2014). Misperception of body weight and associated factors. *Nurs Health Sci*, **16**, 468-75.
- Chang VW, Christakis NA (2003). Self-perception of weight appropriateness in the United States. *Am J Prev Med*, **24**, 332-9.
- Choi Y, Choi E, Shin D, et al (2015) The Association between body weight misperception and psychosocial factors in Korean adult women less than 65 years old with normal weight. *J Korean Med Sci*, **30**, 1558-66.
- Denlinger CS, Ligibel JA, Are M, et al (2014a). National comprehensive cancer network. survivorship: nutrition and weight management, Version 2.2014. Clinical practice guidelines in oncology. *J Natl Compr Canc Netw*, **12**, 1396-406.
- Denlinger CS, Ligibel JA, Are M, et al (2014b). National comprehensive cancer network. Survivorship: screening for cancer and treatment effects, Version 2.2014. *J Natl Compr Canc Netw*, **12**, 1526-31.
- Donath SM (2000). Who's overweight? Comparison of the medical definition and community views. *Med J Aust*, **172**, 375-7.
- Greenlee H, Shi Z, Sardo Molmenti CL, et al (2016). Trends in obesity prevalence in adults with a history of cancer: Results from the US National Health Interview Survey, 1997 to 2014. *J Clin Oncol*, **34**, 3133-40.
- Gregory CO, Blanck HM, Gillespie C, et al (2008). Health perceptions and demographic characteristics associated with underassessment of body weight. *Obesity*, **16**, 979-86.
- Hendley Y, Zhao L, Coverson DL, et al (2011). Differences in weight perception among blacks and whites. *J Womens Health*, **20**, 1805-11.
- Herbert J, Peterson KL, Alston L, et al (2017). Comparison between measured and perceived weight status in a nationally representative sample of Australian adults. *Obes Res Clin Pract*, doi: 10.1016/j.orcp.2016.12.009.
- International obesity task force and world Health Organization (2000). The Asian-Pacific perspective: Redefining obesity and its treatment, Body fat distribution, Health Communications Australia Pty Limited, Australia, pp 20.
- http://www.wpro.who.int/nutrition/documents/Redefining_obesity/en/index.html Accessed 11 Feb, 2017.
- Kim DS, Kim HS, Cho Y, et al (2008). The effects of actual and perceived body weight on unhealthy weight control behaviors and depressed mood among adult women in Seoul, Korea. *J Prev Med Public Health*, **41**, 323-30.
- Kim JS, Lee K (2010). The relationship of weight-related attitudes with suicidal behaviors in Korean adolescents.

- Obesity*, **18**, 2145-51.
- Kim S, So WY (2014). Prevalence and sociodemographic trends of weight misperception in Korean adolescents. *BMC Public Health*, **13**, 452.
- Ligibel JA, Alfano CM, Courneya KS, et al (2014). American society of clinical oncology position statement on obesity and cancer. *J Clin Oncol*, **32**, 3568-74.
- Lim D, Ha M, Song I (2015). Trends in major cancer mortality in Korea, 1983-2012, with a joinpoint analysis. *Cancer Epidemiol*, **39**, 939-46
- Lim H, Wang Y (2013). Body weight misperception patterns and their association with health-related factors among adolescents in South Korea. *Obesity*, **21**, 2596-603.
- Marshall C, Lengyel C, Utioh A (2012). Body dissatisfaction among middle-aged and older women. *Can J Diet Pract Res*, **73**, 241-7.
- Monteagudo C, Dijkstra SC, Visser M (2015). Self-perception of body weight status in older Dutch adults. *J Nutr Health Aging*, **19**, 612-8.
- Oh CM, Won YJ, Jung KW, et al (2016). Community of population-based regional cancer registries. Cancer statistics in Korea: incidence, mortality, survival, and prevalence in 2013. *Cancer Res Treat*, **48**, 436-50.
- Park SM, Yun YH, Kim YA, et al (2016). Prediagnosis body mass index and risk of secondary primary cancer in male cancer survivors: A large cohort study. *J Clin Oncol*, **34**, 4116-24.
- Yahia N, El-Ghazale H, Achkar A, Rizk S (2011). Dieting practices and body image perception among Lebanese university students. *Asia Pac J Clin Nutr*, **20**, 21-8.