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The impact of weight misperception on health-related quality of life in Korean adults (KNHANES 2007–2014): a community-based cross-sectional study

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ABSTRACT

Background/objectives Weight perception, especially misperception, might affect health-related quality of life (HRQoL); however, related research is scarce and results remain equivocal. We examined the association between HRQoL and weight misperception by comparing obesity level as measured by body mass index (BMI) and weight perception in Korean adults.

Methods Study subjects were 43 883 adults aged 19 years or older from cycles IV (2007–2009), V (2010–2012) and VI (2013–2014) of the Korean National Health and Nutrition Examination Survey. Multiple regression analyses comprising both logit and tobit models were conducted to evaluate the independent effect of obesity level as measured by BMI, weight perception and weight misperception on HRQoL after adjusting for demographics, socioeconomic status and number of chronic diseases. We also performed multiple regressions to explore the association between weight misperception and HRQoL stratified by BMI status.

Results Obesity level as measured by BMI and weight perception were independently associated with low HRQoL in both separate and combined analyses. Weight misperception, including underestimation and overestimation, had a significantly negative impact on HRQoL. In subgroup analysis, subjects with BMI ranges from normal to overweight who misperceived their weight also had a high risk of low HRQoL. Overestimation of weight among obese subjects associated with low HRQoL, whereas underestimation of weight showed no significant association.

Conclusions Both obesity level as measured by BMI and perceiving weight as fat were significant risk factors for low HRQoL. Subjects who incorrectly perceived their weight relative to their BMI status were more likely to report impaired HRQoL, particularly subjects with BMI in the normal to overweight range. Based on these findings, we recommend political and clinical efforts to better inform individuals about healthy weight status and promote accurate weight perception.

Strengths and limitation of this study

- ► A strength of this study is that it is the first Asian study to investigate the impact of weight misperception on health-related quality of life (HRQoL) for all body mass index ranges.
- ► This study revealed the significant effect of weight misperception on HRQoL after adjusting for age, chronic diseases and socioeconomic status.
- ► Nationally representative data with a large sample size.
- ► The cross-sectional design and unmeasured confounding factors limit causal inferences from our results.

INTRODUCTION

Obesity has been a public health concern owing to its rapidly increasing prevalence and deleterious health effects in both developed and developing countries.[1] A large number of studies indicate that obesity is an important risk factor for various physical health problems, including type 2 diabetes, cardiovascular disease, stroke and cancer.[2] Harmful effects of obesity on psychological health conditions, such as stress,[3] depression[4] and certain mental illness,[5] have also been observed. The medical problems associated with obesity have a major impact on public health; obesity also affects individuals' functional capacity to lead active lives.[6]

Health-related quality of life (HRQoL) can be an appropriate health outcome to use in evaluating these multifaceted effects of obesity on both physical and psychosocial health. Over the past few decades, epidemiological studies have revealed a significant association between obesity and impaired HRQoL, showing a dose–response relationship between HRQoL impairment and increase in body mass index (BMI).[6 7] Furthermore, studies of patients undergoing bariatric surgery consistently found that weight loss was associated with improvement in HRQoL.[8 9] These findings support the hypothesis that prevention and treatment of obesity are important to improve HRQoL.

Misperception of weight status has been reported as an obstacle to escape from obesity. People with obesity who perceive their weight as normal tend to have a lower desire to control their weight,[10] engage in fewer attempts to lose weight,[10 11] exhibit poor diet habits[12] and engage in less physical activity.[10 13] Similarly, people with normal weight who perceive their weight as obese are more likely to engage in unhealthy weight control activities,[14 15] have a greater risk of obesity[16 17] and experience psychological distress.[18 19] Unfortunately, perceived weight status is often discordant with actual body weight. According to previous studies from the USA and Canada, the proportions of weight misperception were approximately 20% and 30% among men and women, respectively.[20 21] Recent Korean studies reported that approximately 40% of the total study population incorrectly perceived their weight status when compared with actual BMI status,[22] which indicates a substantial difference in weight misperception across countries. This difference may be due to variations in sociocultural background and obesity prevalence, which may affect weight misperception.[23 24]

Weight misperception might have a harmful impact on HRQoL when taking into consideration the substantial evidence regarding the adverse effect of weight misperception on health behaviours and psychological health. However, only a few studies have examined the association between weight misperception and HRQoL, and the findings have been inconsistent. For example, some studies found that subjects who overestimated their weight status showed a significantly lower HRQoL than those who accurately perceived their weight.[25–27] In contrast, other studies reported that subjects who underestimated or overestimated their weight status reported higher HRQoL.[27 28] In addition, there is a bias in the literature towards Western study populations, particularly adolescents and young adults, which presents a challenge in generalising the findings to an Asian adult population. The long-term harmful effects of weight misperception on physical health can be underestimated in younger individuals, because obesity-related health problems frequently do not become apparent until midlife.

In the present study, we explored the pattern of weight misperception by comparing BMI level and weight perception among the Korean adult population. Furthermore, we examined the impact of obesity level as measured by BMI, weight perception and weight misperception on HRQoL.

METHODS

Data/sample

The data analysed in this study were obtained from cycles IV (2007–2009), V (2010–2012) and VI (2013–2014) of the Korean National Health and Nutrition Examination Survey (KNHANES). KNHANES was established and is managed by the Korea Centers for Disease Control (KCDC) to assess the health and nutrition status of the population and provide basic statistics for health policy development for the Korean population. The original data are available to the public through the website of the KCDC. The study design and data collection methods were approved by the research ethics committee of the KCDC. KNHANES data were obtained by complex, multistage, probability sampling to be representative of the civilian, non-institutionalised Korean population. For example, in the 2011 survey, the design involved two stages: (1) selecting a sample of 192 primary sampling units (PSUs) among approximately 200 000 PSUs for the whole country; and (2) systematic sampling of 20 households among each PSU that consisted of an average of 60 households. Finally, all individuals in the selected households were targeted for the survey.[29] Since 2007, KNHANES has been conducted every year based on a rolling sample survey, rather than the periodic survey that had been administered in the past. One cycle comprises 3 years of rolling samples; two or more cycles can be combined for analysis. In the present study, we combined three survey cycles to overcome the limitation of the small sample size of subjects with severe obesity. We limited our analysis to subjects aged 19 years or older (18 406 in KNHANES IV, 19 599 in V and 12 089 in VI) because EuroQol five dimensions questionnaire (EQ-5D) were only administered to adults. We also excluded pregnant women and respondents with missing BMI, EQ-5D or covariate data. Finally, a total of 43 883 subjects were included in this study. The demographic distributions of final study subjects were similar to those in the original KNHANES data.[29]

Measures

HRQoL was assessed using a Korean version of EQ-5D. EQ-5D is a widely used generic HRQoL instrument, and the validity of the Korean version was successfully demonstrated in a previous study.[30] The instrument consists of five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. The scores of a completed EQ-5D can be converted into a single summarised index score using a value set obtained through the time trade-off valuation method. Although various value sets are available, the value set we applied was derived from a representative Korean sample,[31] and officially used for reporting KNHANES by the KCDC. The EQ-5D index score represents health status on a continuum from 0 to 1; a higher index score indicates better health status. We defined low HRQoL as the lowest quintile of EQ-5D index score and the cut-off point as 0.867 because we observed a notable decline under 20% of the score in this population. The previous Korean studies also used the same cut-off point for low HRQoL.[32–34]

Anthropometric data (ie, height and weight) in KNHANES were measured by trained nurses using a standardised procedure. BMI was calculated as weight (kg)/height (m^2) and categorised into four levels based on Asian criteria for obesity,[35] including underweight (<18.5 kg/m^2), normal/overweight (18.5–<25 kg/m^2), obesity (25–<30 kg/m^2) and severe obesity (≥30 kg/m^2).

Weight perception was assessed with a self-reported questionnaire. The participants were asked 'What do you think about your shape?' and responded 'very thin', 'somewhat thin', 'normal', 'somewhat fat' or 'very fat'. The responses of thinness (very and somewhat) were combined into one level for matching with the BMI categories. We created a variable with two values (underestimation and overestimation) to classify weight perception compared with obesity level as measured by BMI to represent discordance between weight perception and BMI. We matched the BMI ranges from normal to overweight (18.5–<25 kg/m^2) to the normal of weight perception according to previous Korean studies on weight misperception.[22 36 37]

We considered the time of survey cycles (KNHANES IV, V and VI), demographics, socioeconomic status and comorbidity of chronic disease as covariates. The number of chronic diseases was calculated based on self-reported medical history of the following diseases diagnosed by a physician: diabetes, hypertension, hyperlipidaemia, cancers (gastric cancer, liver cancer, lung cancer, colon cancer, breast cancer and uterine cancer), pulmonary diseases (asthma, tuberculosis, rhinitis, chronic obstructive pulmonary disease), cardiovascular diseases (stroke, angina/myocardial infarction), thyroid disease, arthritis, renal failure, hepatitis and liver cirrhosis.

Statistical analysis

We calculated the unweighted frequencies and weighted proportions with SEs to present the general distributions of demographics, socioeconomic status, number of chronic diseases, obesity level by BMI and weight perception. The proportions of low HRQoL according to obesity level as measured by BMI, weight perception and weight misperception were estimated. These proportions are presented by survey cycle to confirm the data stability of the EQ-5D index score across the time of the survey. The percentages of agreement between the obesity level by BMI and the weight perception were calculated, and overall agreement was evaluated using the Kappa statistic.

Multiple regression analyses comprising both binary and linear models were performed to evaluate the effects of BMI, weight perception and weight misperception on low HRQoL after adjusting for various covariates. Low HRQoL was analysed with a binary logit model. Tobit regression modelling was performed to analyse the full EQ-5D index score taking into account right censoring of the score. First, we performed separate regressions for BMI, weight perception and weight misperception to evaluate the respective effects of these variables on HRQoL. We then explored the association between weight misperception and HRQoL after stratification by BMI category. All regression models were adjusted for demographics, socioeconomic status and number of chronic diseases to control the possible confounding effects.

The complex sampling design and sample weights for combining survey cycles were taken into account in all analyses. Analyses were conducted with SAS V.9.4 and STATA V.11.

RESULTS

The distribution of demographics, obesity level by BMI, weight perception and HRQoL are presented in table 1. Based on BMI criteria, 60.5% of men and 66.0% of women had normal weight. The percentages of subjects who believed their weight to be normal were 39.5% and 40.6% for men and women, respectively. These values were much lower than the percentages of subjects who were actually of normal weight. While the prevalence of obesity was higher in men than in women, the proportion of men perceiving their weight as fat was lower than in women. Generally, women presented with a higher prevalence of chronic diseases and lower HRQoL compared with men.

As shown in table 2, 39.4% of men and 43.2% of women misperceived their weight. Although the proportion of misperception was similar in both sexes, the type for misperception was different between men and women. Men were more likely to underestimate their weight compared with women (27.2% of men and 15.6% of women); in contrast, women were more likely to overestimate their weight (12.2% of men, 27.6% of women). The subjects with normal weight according to BMI reported the highest weight misperception in both sexes. Overall agreement between the obesity level by BMI and the weight perception status was fair in both sexes (kappa coefficient men=0.38; women=0.32).

Figure 1 shows the prevalence of low HRQoL according to BMI level, weight perception and weight misperception by survey cycle and sex. All survey cycles showed similar proportions of low HRQoL according to BMI and weight perception status. The mean, median and quartile distributions of EQ-5D index score according to BMI, weight perception and weight misperception are also presented in online supplementary table 1. For men, the proportion of low HRQoL was slightly higher in the subjects with underweight or severe obesity by BMI than in those with normal BMI. The same association pattern was observed for weight perception status. For women, the proportion of low HRQoL increased with BMI. Higher prevalence of low HRQoL was observed in the subjects who perceived their weight as underweight or (somewhat/very) fat compared with those who perceived their weight as normal, in both sexes. Regarding weight misperception, subjects who underestimated their weight were more likely to report low HRQoL than those who perceived their weight accurately, a pattern seen more obviously in women than in men. This trend was not observed in subjects who overestimated their weight, but these individuals were also more likely to report low HRQoL after adjustments (data shown in table 3).

Table 3 presents the results of logit and tobit models for HRQoL according to BMI level, weight perception and misperception in the univariate and multiple regression analyses. In the binary model of multivariable analysis, the ORs of low HRQoL were higher in underweight or obese subjects according to BMI than in those with normal weight. Women also had higher ORs of low HRQoL in

Table 1 General distribution of socioeconomic status, chronic disease, obesity level by BMI, weight perception and HRQoL by sex

	Men (n=18 602)		Women (n=25 281)	
	N*	% (SE)†	N	% (SE)
Survey cycle				
KNHANES IV (2007–2009)	6981	33.0 (0.5)	9408	32.5 (0.5)
KNHANES V (2010–2012)	7370	40.7 (0.6)	10 005	40.9 (0.5)
KNHANES VI (2013–2014)	4251	26.4 (0.5)	5868	26.7 (0.4)
Age				
19–40	5719	42.3 (0.6)	7870	38.3 (0.5)
40–59	6915	40.4 (0.5)	9434	39.7 (0.4)
60+	5968	17.4 (0.3)	7977	22.0 (0.4)
Education				
Elementary school	3424	12.2 (0.3)	8208	24.9 (0.4)
Middle school	2226	10.0 (0.3)	2593	10.0 (0.2)
High school+	12 952	77.8 (0.4)	14 480	65.1 (0.5)
Equivalised household income‡				
1T	5931	26.8 (0.5)	9002	31.6 (0.5)
2T	6376	36.2 (0.5)	8248	34.6 (0.5)
3T	6295	37.1 (0.6)	8031	33.8 (0.6)
Marital status				
Single	3109	26.1 (0.5)	3070	17.3 (0.4)
Married	14 495	69.4 (0.5)	17 294	66.6 (0.4)
Divorced/separated/widowed	998	4.6 (0.2)	4917	16.1 (0.3)
Job				
Manual	4811	28.7 (0.5)	4002	18.5 (0.3)
Non-manual	8952	48.2 (0.5)	8022	31.2 (0.4)
Others	4839	23.1 (0.4)	13 257	50.3 (0.4)
Chronic disease				
0	10 267	62.1 (0.4)	12 526	54.8 (0.4)
1	4976	24.6 (0.4)	6691	25.7 (0.3)
2+	3359	13.2 (0.3)	6064	19.5 (0.3)
Obesity level by BMI				
Underweight (<18.5 kg/m^2)	596	3.0 (0.2)	1417	6.7 (0.2)
Normal/overweight (18.5–<25 kg/m^2)	11 414	60.5 (0.4)	16 524	66.0 (0.4)
Obese (25–<30 kg/m^2)	5944	32.2 (0.4)	6276	22.9 (0.3)
Severe obesity (≥30 kg/m^2)	648	4.3 (0.2)	1064	4.4 (0.2)
Weight perception				
Thin (somewhat/very)	4051	21.3 (0.4)	3707	13.9 (0.3)
Normal	7660	39.5 (0.4)	10 246	40.6 (0.4)
Somewhat fat	5922	33.2 (0.4)	8884	35.2 (0.4)
Very fat	969	6.1 (0.2)	2444	10.2 (0.2)
Low HRQoL				
Lowest quintile of EQ-5D score	2619	10.0 (0.3)	5914	18.9 (0.3)

*Unweighted frequency.
†Weighted proportion (SE).
‡Equivalised household income was calculated as the total household income divided by the square root of the number of household members; these scores were divided into tertiles.
BMI, body mass index; HRQoL, health-related quality of life; KNHANES, Korean National Health and Nutrition Examination Survey.

Table 2 Agreement between BMI and weight perception by sex

	Weight perception			
	Thin	Normal	Somewhat fat	Very fat
Obesity level by BMI	n (%)*	n (%)	n (%)	n (%)
Men				
Underweight (<18.5 kg/m^2)	549 (3.0)	41 (0.2)	4 (0.0)	2 (0.0)
Normal/overweight (18.5–<25 kg/m^2)	3437 (18.5)	6304 (33.9)	1641 (8.8)	32 (0.2)
Obese (25–<30 kg/m^2)	61 (0.3)	1293 (7.0)	4044 (21.7)	546 (2.9)
Severe obesity (≥30 kg/m^2)	4 (0.0)	22 (0.1)	233 (1.3)	389 (2.1)
Women				
Underweight (<18.5 kg/m^2)	1125 (4.5)	286 (1.1)	5 (0.0)	1 (0.0)
Normal/overweight (18.5–<25 kg/m^2)	2389 (9.5)	8859 (35.0)	5002 (19.8)	274 (1.1)
Obese (25–<30 kg/m^2)	182 (0.7)	1058 (4.2)	3625 (14.3)	1411 (5.6)
Severe obesity (≥30 kg/m^2)	11 (0.0)	43 (0.2)	252 (1.0)	758 (3.0)
Obesity level by BMI versus weight perception	**Men**		**Women**	
	n	%	n	%
Accurate weight perception (concordance)	11 286	60.7	14 367	56.8
Weight misperception (discordance)				
Underestimate	5050	27.2	3935	15.6
Overestimate	2266	12.2	6979	27.6
Agreement				
Kappa coefficient	0.38		0.32	

*Unweighted sample size and total per cent by sex.
BMI, body mass index.

the underweight, obesity and severe obesity groups than in the normal weight group. Likewise, subjects of both sexes who perceived their weight as thin, somewhat fat or very fat had higher ORs for low HRQoL than those who perceived their weight as normal. The ORs of low HRQoL were higher in subjects who underestimated or overestimated their weight than in those who accurately perceived their weight. The association patterns were similar in logit and tobit models in general, although obesity level according to BMI among men had no statistical significance in a tobit model. When we considered the weight perception or misperception in adjusting the obesity level by BMI, the impacts of HRQoL by actual, perceived weights or misperception were similar with separate models in men and women (online supplementary table 2).

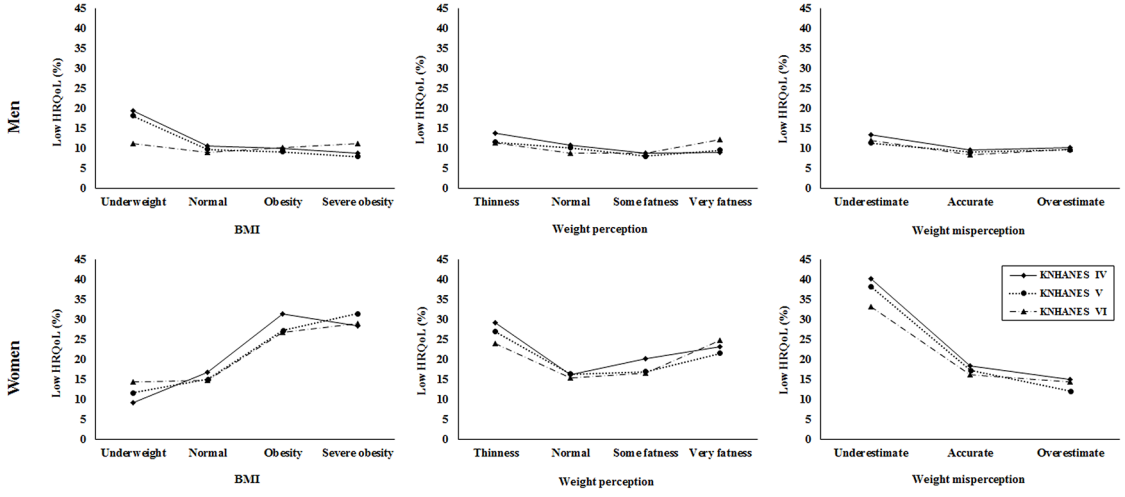

Figure 1 Prevalence of low HRQoL according to BMI, weight perception and weight misperception by survey cycle and sex. BMI, body mass index; HRQoL, health-related quality of life.

Table 3 Binary and continuous models for EQ-5D scores according to obesity level by BMI, weight perception and weight misperception by sex

	Univariate		Multivariate†	
	Logit model OR (95% CI)	Tobit model β (SE)	Logit model OR (95% CI)	Tobit model β (SE)
Obesity level by BMI				
Men				
Underweight (<18.5 kg/m^2)	1.86 (1.46 to 2.37)	−0.044* (0.018)	1.58 (1.19 to 2.10)	−0.013* (0.016)
Normal/overweight (18.5–<25 kg/m^2)	–	–	–	–
Obese (25–<30 kg/m^2)	0.99 (0.88 to 1.11)	0.012 (0.007)	1.11 (0.97 to 1.26)	0.005* (0.007)
Severe obesity (≥30 kg/m^2)	0.93 (0.69 to 1.25)	0.006 (0.016)	1.51 (1.06 to 2.13)	−0.022* (0.015)
Women				
Underweight (<18.5 kg/m^2)	0.72 (0.58 to 0.88)	0.033* (0.010)	1.54 (1.20 to 1.97)	−0.023* (0.009)
Normal/overweight (18.5–<25 kg/m^2)	–	–	–	–
Obese (25–<30 kg/m^2)	2.16 (2.00 to 2.33)	−0.078* (0.005)	1.30 (1.18 to 1.42)	−0.013* (0.005)
Severe obesity (≥30 kg/m^2)	2.32 (1.98 to 2.72)	−0.100* (0.011)	1.59 (1.33 to 1.90)	−0.038* (0.009)
Weight perception				
Men				
Thin (somewhat/very)	1.25 (1.10 to 1.42)	−0.031* (0.008)	1.31 (1.14 to 1.52)	−0.027* (0.008)
Normal	–	–	–	–
Somewhat fat	0.83 (0.72 to 0.94)	0.012 (0.008)	1.18 (1.01 to 1.37)	−0.016* (0.007)
Very fat	1.00 (0.79 to 1.28)	−0.019 (0.015)	1.74 (1.32 to 2.29)	−0.051* (0.014)
Women				
Thin (somewhat/very)	1.92 (1.72 to 2.14)	−0.085* (0.007)	1.53 (1.34 to 1.76)	−0.045* (0.006)
Normal	–	–	–	–
Somewhat fat	1.15 (1.05 to 1.26)	−0.023* (0.005)	1.37 (1.23 to 1.52)	−0.029* (0.004)
Very fat	1.55 (1.36 to 1.77)	−0.066* (0.008)	1.76 (1.51 to 2.05)	−0.057* (0.007)
Weight misperception				
Men				
Underestimate	1.38 (1.23 to 1.55)	−0.033* (0.007)	1.18 (1.03 to 1.34)	−0.013* (0.006)
Accurate weight perception	–	–	–	–
Overestimate	1.10 (0.93 to 1.30)	−0.023* (0.010)	1.28 (1.05 to 1.56)	−0.031* (0.009)
Women				
Underestimate	2.87 (2.61 to 3.15)	−0.129* (0.007)	1.18 (1.05 to 1.32)	−0.020* (0.006)
Accurate weight perception	–	–	–	–
Overestimate	0.76 (0.69 to 0.83)	0.012* (0.005)	1.15 (1.04 to 1.28)	−0.022* (0.005)

*p<0.05.
†Adjusted for time of survey cycle, age, marital status, job, household income, education, and number of chronic diseases. OR for lowest quintile of EQ-5D scores.
BMI, body mass index.

We examined the association between weight misperception and HRQoL after stratification by BMI category (table 4). Both underestimation and overestimation of weight had a significantly negative impact on HRQoL in the subgroup of 'normal/overweight' in logit and tobit models. In the subgroup of 'obesity', only weight overestimation had an adverse effect on HRQoL in both sexes in the tobit model, with statistical significance. Although no statistical significance was found in the logit model, similar association patterns were observed. However, no negative impact on HRQoL was observed in the subgroups of 'underweight' and 'severe obesity' according to BMI level.

DISCUSSION

This study examined the impact of obesity level according to BMI, weight perception and weight misperception on HRQoL. Subjects with underweight or obesity by BMI were more likely to report low HRQoL. Similarly, subjects

Table 4 Binary and continuous models for EQ-5D scores according to weight misperception by BMI level in each sex

	Obesity level by BMI							
	Underweight (<18.5 kg/m²)		Normal/overweight (18.5–<25 kg/m²)		Obesity (25–<30 kg/m²)		Severe obesity (≥30 kg/m²)	
	Logit model OR (95% CI)	Tobit model β (SE)	Logit model OR (95% CI)	Tobit model β (SE)	Logit model OR (95% CI)	Tobit model β (SE)	Logit model OR (95% CI)	Tobit model β (SE)
Weight misperception								
Men								
Underestimate			1.29 (1.09 to 1.52)	−0.025* (0.008)	1.24 (0.98 to 1.57)	−0.001 (0.011)	0.78 (0.38 to 1.59)	0.034 (0.025)
Accurate weight perception	–	–	–	–	–	–	–	–
Overestimate	0.57 (0.23 to 1.40)	0.075 (0.055)	1.44 (1.14 to 1.82)	−0.036* (0.010)	1.37 (0.94 to 1.98)	−0.035* (0.016)		
Women								
Underestimate			1.48 (1.27 to 1.72)	−0.047* (0.008)	0.84 (0.70 to 1.02)	0.018 (0.011)	1.13 (0.72 to 1.80)	0.034 (0.018)
Accurate weight perception	–	–	–	–	–	–	–	–
Overestimate	0.78 (0.38 to 1.59)	0.033 (0.019)	1.32 (1.15 to 1.51)	−0.032* (0.005)	1.15 (0.93 to 1.41)	−0.026* (0.010)		

All models were adjusted for time of survey cycle, age, marital status, job, household income, education and number of chronic diseases. OR for lowest quintile of EQ-5D scores.
*p<0.05.
BMI, body mass index.

who perceived their weight as thin or fat tended to have worse HRQoL. However, substantial discordance was observed between obesity level as measured by BMI and weight perception. That is, weight misperception had an adverse effect on HRQoL. Specifically, subjects with BMI in the range from normal to overweight who misperceived their weight (ie, underestimated or overestimated) showed a significantly higher risk of impaired HRQoL.

The harmful effects of obesity on HRQoL have consistently been reported[6 7] and were also confirmed by our results. We also found significant effects on HRQoL of weight perception as fat, similar to previous studies.[20 38] However, our results were different from those of previous studies when we considered together the influence of obesity level by BMI and weight perception in the logit model. Previous studies reported that weight perception was more strongly associated with HRQoL, rather than BMI level,[20 38] whereas, in our study, the effect of weight perception on HRQoL was not stronger than that of BMI level. This discrepancy might be due to several differences. First, we used measured height and weight for calculating BMI, whereas the previous study used self-reported height and weight.[20] The calculation of BMI using self-reported height and weight can lead to significant inaccuracies.[39] Recent studies revealed that use of self-reported BMI is likely to induce biased estimations of weight misperceptions.[40 41] Second, our study accessed HRQoL based on the EQ-5D score, which comprehensively measures the impact of health status on psychological and physical functioning. In contrast, previous studies applied self-rated health and life satisfaction as HRQoL indicators, which could limit the evaluation of the various HRQoL domains measured by EQ-5D, especially physical functioning.[20] Third, another previous study categorised BMI into two levels (not overweight vs overweight: over BMI 25 kg/m²),[38] whereas we divided BMI into four levels for more detailed investigation on the association between BMI and HRQoL. Our findings indicated that the severe obesity as measured by BMI (>30 kg/m²) showed a stronger association with lower HRQoL.

This study showed that weight perception did not commonly agree with actual body weight, and approximately 40% of subjects misperceived their weight. The pattern of weight misperception showed a distinct sex difference. Men were more likely to underestimate their weight, whereas women were more likely to overestimate, a finding consistent with the results of previous studies.[21 42 43] Weight perception is the subjective self-evaluation of weight status, which may be affected by the sociocultural environment.[44] Consequently, the sex difference in inaccurate weight perception could originate from different social norms of ideal body weight between men and women. In Korea, thinness is considered more attractive in women and, in contrast, a large body is regarded as a symbol of power and wealth in men.[45] Social weight comparisons might play an important role in this phenomenon.[21 46]

Although our findings showed typically different patterns of weight misperception between sexes, the negative effect of weight misperception on HRQoL was shown for both sexes. Underestimation or overestimation of weight may cause unhealthy dietary intake, unhealthy behaviours and psychological distress.[10–13 15–19] These findings support the hypothesis that weight misperception, including underestimation and overestimation, could have an adverse effect on HRQoL, directly or indirectly. Previous studies have also demonstrated significantly negative effects of overestimation of weight on HRQoL.[25–27] However, several studies showed different results, either a positive association[28] or non-significant association[20] between underestimated and overestimated weight misperception and HRQoL. These studies involved self-reported BMI measures,[20] different HRQoL tools (ie, Pediatric Quality of Life Inventory(PedsQL) or life satisfaction)[20 28] or adolescent subjects.[25–28] Thus, direct comparison of those studies with our findings should be performed with caution.

In a subgroup analysis by BMI level, weight misperception of subjects with BMI ranges from normal to overweight had a negative impact on HRQoL as well. However, there was no significant association between weight misperception and HRQoL in underweight and severely obese subjects. Weight discrimination is prevalent in many societies.[47–49] If underweight or obesity is a stigmatised condition, this may lead people of normal weight who misperceive their weight to experience unnecessary psychological distress regarding weight and employ inadequate coping responses.[50 51] Moreover, self-stigmatisation in obesity has been associated with future weight gain.[16 17] Likewise, obese people who perceive their weight as 'very fat' may experience more stress compared with obese people who identify their weight as 'somewhat fat'. Although accurate weight perception in obese people could encourage healthy weight, too much concern about their weight may cause adverse effects on HRQoL. However, people with underweight or severe obesity were more likely to suffer from existing chronic conditions[1 2]; thus, the effect of weight misperception might be attenuated among these groups. Moreover, misperception in underweight or severely obese people may provide comfort in regard to mental health,[20 28] even though the other harmful effects of obesity continue to exist.

The present study highlighted the significantly adverse effect of weight misperception on HRQoL. Considering that a large number of people fail to recognise their actual weight status, we suggest that public health efforts, such as publicising criteria for healthy weight, are indicated. Clinical practitioners should also inform patients, both with and without obesity, of their accurate weight status. This was the first Asian study to examine the impact of weight misperception, including both underestimation and overestimation, on HRQoL for individuals of all BMI ranges. The advantage of this study was that it investigated the association between weight misperception and HRQoL through analysis of nationally representative data with a large sample size. However, this study has several limitations. First, the cross-sectional design limits causal inferences from our results. Second, other confounding factors, such as unmeasured illness and psychological conditions, could affect weight misperception and HRQoL. Third, the effect size of weight misperception was quite small. For example, people who underestimated or overestimated their weight had an approximately 20%–50% increased risk of low HRQoL compared with people who perceived their weight correctly. This result was obtained after adjusting for the influences of age, chronic disease and socioeconomic status. Therefore, the effect of weight misperception was non-negligible considering the strong effect of age and chronic disease on health and quality of life. Fourth, although we defined low HRQoL as the lowest quintile of the EQ-5D score, generally there was not a clear cut-off point for low HRQoL. The EQ-5D score showed a left skewed distribution with a ceiling score of 1. There have been several methodological approaches to analysis of the EQ-5D index score including quantile regression, tobit model and Censored least absolute deviations(CLAD) model.[52 53] Unfortunately, statistical software has not yet supported the quantile regression or CLAD model for complex survey data. When the complex sampling design is not applied properly, SEs could be overestimated or underestimated. Therefore, we have considered the EQ-5D scores as right-censored data and performed tobit regression modelling taking into account the complex survey design using STATA.

CONCLUSION

The findings of this study provide important insights into obesity level by BMI, weight perception and HRQoL for adults. Underweight and obesity, as measured by BMI, were risk factors for low HRQoL, after adjusting for weight perception and various covariates. Inaccurate weight perceptions, including both underestimation and overestimation, were significantly associated with low HRQoL. In subgroup analysis, our results showed that subjects with normal BMI, who perceived their weight as thin or fat, had significantly lower HRQoL. Our findings suggest that public health strategies should promote healthy weight and focus on fostering accurate weight perception among the population.

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