

# Body Weight Perception and Quality of Life in Nurses of Nantong City, China: A Cross-Sectional Study

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**Research**

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# Abstract

**Background** To explore associations of body weight perception with body mass index and quality of life among nurses.

**Methods** A total of 456 nurses (18-55 years old) were surveyed in a cross-sectional study in a hospital of Nantong City, China. Data on social-demographic characteristics, body mass index, body weight perception and quality of life were collected.

**Results** Our study showed that 40.6% of nurses misconceived their weight status. Married nurses were more likely than unmarried to underestimate their weight. Significant disparity in mental health, vitality and mental component summary scores were found in nurses who underestimate their weight compared to those correctly perceived or over or who overestimate their weight.

**Conclusion** Interventions should be designed to help nurses address body weight status misconception, thereby contributing to label themselves and patients as underweight, normal weight, overweight or obese correctly, and in turn, giving reasonable eating habits and physical activities health education.

## Introduction

Obesity is a globalizing health challenge. It is also a known risk factor for the development of other diseases, including type 2 diabetes, CVD, gallstones, musculoskeletal disorders and certain cancers.<sup>1</sup> According to BMI, the prevalence of general obesity and overweight among Chinese women was 14.3% and 17.7%, respectively.<sup>2</sup> However, 64% of overweight and obese women underestimated their body weight status.<sup>3</sup> As reported, weight underestimation may be an important obstacle to effective weight management and prevention of weight-related chronic diseases.<sup>4</sup> This kind of subjective evaluation of actual weight status is called body weight perception (BWP).<sup>5</sup> A correct body weight perception means that people know their current weight status correctly, which is essential to promote healthy lifestyle behavior, optimal weight management and the prevention of weight-related diseases.<sup>6</sup> BWP was associated with body mass index (BMI).<sup>7</sup> However, previous study showed the consistency between self-perceived and actual body weight status was poor.<sup>3</sup> Therefore we were specifically interested in the difference between BWP and actual body weight status in Chinese women.

In addition, previous studies also showed that participants who overestimate their body weight status had comparatively low health-related quality of life (QoL).<sup>8,9</sup> To our knowledge, the relationship between QoL and BWP in Chinese women have not been reported in previous studies.

Thus, this study attempted to explore the relationship between BMI and BWP in Chinese women. Furthermore, QoL of the participants was also explored in this study.

## Methods

### Study design, study setting and participants

A cross-sectional hospital-based study was conducted among nursing staff in Affiliated Haian Hospital of Nantong University between January 2018 and February 2018. A self-report questionnaire was distributed to potential female participants. Cases were excluded on the basis of the following criteria: Exclusion criteria: (1) age < 18 or >80 years at the time of interview; (2) pregnant and lactating women; (3) with the following complications (Diabetes, hypertension, dyslipidemia, cancer, pulmonary disease, cardiovascular disease, musculoskeletal disorders, etc.) that were evaluated by annual physical examination; and (4) those who did not complete the questionnaire. In total, 456 nurses were enrolled for investigation and completed questionnaires. The response rate is 72.4%. In compliance with the Helsinki declaration, all nurses were told about the concept of the study and signed an informed consent prior to commencement of the study. Approval to conduct this study was obtained from the Ethics Committee of the Affiliated Haian Hospital of Nantong University.

### Measures

#### Sociodemographic characteristics

Age, marital status, income, level of education, height and weight were included in the present analyses.

#### Weight status

Nurses' self-reported height and weight as used to estimate self-report BMI (kg/m<sup>2</sup>). Previous studies have found that self-reported height and weight provided adequate estimates for actual height and weight in population-based epidemiological studies.<sup>10,11</sup> We classified the participants as underweight (BMI <18.5 kg/m<sup>2</sup>), normal weight (BMI 18.5-22.9 kg/m<sup>2</sup>), overweight (BMI 23.0-27.5 kg/m<sup>2</sup>) and obese (BMI ≥27.5 kg/m<sup>2</sup>) based on the WHO standards.<sup>12,13</sup>

#### Body weight perception

Participants self-rated weight status were sorted as "underweight", "normal weight", "overweight" and "obese" according to a single questionnaire item: "How do you think of yourself in terms of weight?" Underestimation of body weight status was defined as reporting at least one BMI category lower than the self-rated weight status. Overestimation of body weight status was defined as reporting at least one BMI category higher than the self-rated weight status.

#### Quality of life

QoL was assessed with the 36-Item Short Form Health Survey questionnaire (SF-36), a well-validated, 36-item, self-report measure.<sup>14</sup> This generates 8 scales scores, namely physical functioning (PF), role physical (RP), body pain (BP), general health (GH), energy/fatigue (VT), social functioning (SF), role emotional

(RE), and mental health (MH). All scales do contribute in different proportions to the scoring of both Physical Component Summary (PCS) and Mental Component Summary (MCS) measures.

### Statistical Analysis.

Statistical analyses were conducted with SPSS 21.0. Descriptive statistics were calculated for all variables measured. Continuous variables were presented as means and standard deviations and were compared using t tests (normal distribution), or Mann–Whitney’s test (skewed distribution). Categorical variables were presented as frequencies and percentages. Chi-square test was used to make comparison. One way ANOVA and post hoc tests (LSD test) were used to compare between BWP categorical and QoL. A P-value of <0.05 was considered statistically significant. The concordance between self-perceived body weight status and self-reported body weight status was assessed by the Kappa coefficient.

## Results

### Sample characteristics

We investigated Chinese nurses in Nantong City. The mean age was 30.7 ± 7.23 years. We considered 4 age groups: 18–24 years(20.0%), 25–34 years (54.2%), 35–44 years(21.0%) and 45–55 years(4.8%). Education category was subdivided into Diploma of higher education (30.5%) and Bachelor degree(69.5%). The mean BMI was 21.98 ± 2.784 kg/m<sup>2</sup> for the overall sample. For actual weight groups, BMI revealed 8.8% to be underweight, 20.2% to be overweight and 13.6% to be obese, which was calculated by self-reported weight and height. However, 11.0% perceived themselves as underweight, 36.4% perceived themselves as overweight and 3.7% perceived themselves as obese. Chi-square tests indicated significant differences in BMI category by age ( $\chi^2 = 39.119$ ,  $p < 0.001$ ) and marital status ( $\chi^2 = 17.406$ ,  $p < 0.001$ ). Chi-square tests revealed no significant difference in BWP by age ( $\chi^2 = 10.112$ ,  $p = 0.341$ ), education ( $\chi^2 = 2.132$ ,  $p = 0.545$ ), marital status( $\chi^2 = 2.617$ ,  $p = 0.455$ ) and per-capita disposable income ( $\chi^2 = 4.425$ ,  $p = 0.619$ ). The results are presented in Table 1.

Table 1  
Demographic characteristics of the sample in body weight perception and BMI category.

Variables	Overall sample	BMI, N(%)				$\chi^2$	P	Body weight perception, N(%)				X
		underweight	normal weight	overweight	obese			underweight	normal weight	overweight	obese	
All respondents	456	40(8.8)	262(57.5)	92(20.2)	62(13.6)			50(11.0)	223(48.9)	166(36.4)	17(3.7)	
Age (year)						39.119	< 0.001					1
18–24	91	17(18.7)	51(56.0)	17(18.7)	6(6.6)			15(16.5)	46(50.5)	27(29.7)	3(3.3)	
25–34	247	22(8.9)	140(56.7)	40(16.2)	45(18.2)			27(10.9)	117(47.4)	91(36.8)	12(4.9)	
35–44	96	1(1.0)	59(61.5)	28(29.2)	8(8.3)			7(7.3)	49(51.0)	39(40.6)	1(1.0)	
45–55	22	0(0.0)	12(54.5)	7(31.8)	3(13.6)			1(4.5)	11(50.0)	9(40.9)	1(4.5)	
Education						3.293	0.349					2
Diploma of higher education	139	17(12.2)	78(56.1)	28(20.1)	16(11.5)			17(12.2)	73(52.5)	45(32.4)	4(2.9)	
Bachelor degree	317	23(7.3)	184(58.0)	64(20.2)	46(14.5)			33(10.4)	150(47.3)	121(38.2)	13(4.1)	
Marital status						17.406	0.001					2
married	341	20(5.9)	194(56.9)	78(22.9)	49(14.4)			33(9.7)	169(49.6)	125(36.7)	14(4.1)	
single	115	20(17.4)	68(59.1)	14(12.2)	13(11.3)			17(14.8)	54(47.0)	41(35.7)	3(2.6)	
Per-capita disposable income (RMB)						7.863	0.248					4
< 15000	83	10(12.0)	48(57.8)	11(13.3)	14(16.9)			11(13.3)	41(49.4)	27(32.5)	4(4.8)	
15000–33000	150	14(9.3)	92(61.3)	27(18.0)	17(11.3)			16(10.7)	69(46.0)	62(41.3)	3(2.0)	
> 33000	223	16(7.2)	122(54.7)	54(24.2)	31(13.9)			23(10.3)	113(50.7)	77(34.5)	10(4.5)	

The nurses were classified into 3 groups, namely underestimation, consistency and overestimation. The prevalence of nurses who underestimated their weight status, accurately perceived their weight status and overestimated their weight status were 18.0%, 59.4% and 22.6% respectively. Chi-square tests showed significant differences in consistency of BMI and BWP category by marital status ( $\chi^2 = 6.872$ ,  $p < 0.05$ ) and BMI categories ( $\chi^2 = 175.145$ ,  $p < 0.001$ ). Married

nurses were more likely than single nurses to overestimate their weight. Moreover, no significant difference was found between age, education and per-capita disposable income in consistency of BMI and BWP. The results are presented in Table 2.

Table 2  
Body weight perception by age, education, marital status, per-capita disposable income and BMI.

Variables	Overall sample	Underestimation, N(%)	Consistency, N(%)	Overestimation, N(%)	$\chi^2$	P
All respondents	456	82(18.0)	271(59.4)	103(22.6)		
Age (year)					7.617	0.268
18–24	91	20(22.0)	58(63.7)	13(14.3)		
25–34	247	44(17.8)	144(58.3)	59(23.9)		
35–44	96	14(14.6)	59(61.5)	23(24.0)		
45–55	22	4(18.2)	10(45.5)	8(36.4)		
Education					0.280	0.869
Diploma of higher education	139	27(19.4)	81(58.3)	31(22.3)		
Bachelor degree	317	55(17.4)	190(59.9)	72(22.7)		
Marital status					6.872	<b>0.032</b>
married	341	53(15.5)	204(59.8)	84(24.6)		
single	115	29(25.2)	67(58.3)	19(16.5)		
Per-capita disposable income (RMB)					5.783	0.216
< 18000	83	13(15.7)	51(61.4)	19(22.9)		
18000–39000	150	36(24.0)	85(56.7)	29(19.3)		
> 39000	223	33(14.8)	135(60.5)	55(24.7)		
BMI					175.145	<b>&lt;0.001</b>
underweight	40	0(0.0%)	26(65.0%)	14(35.0%)		
normal weight	262	24(9.2%)	174(66.4%)	64(24.4%)		
overweight	92	29(31.5%)	59(64.1%)	4(4.3%)		
obese	62	50(80.6%)	12(19.4%)	0(0.0%)		

Table 3 provides consistency analysis of BMI and BWP. Significant differences were found in consistency analysis of BMI and BWP by Kappa tests (Kappa = 0.357,  $p < 0.05$ ). The agreements between BMI and BWP was poor (Kappa < 0.4). In fact, the percentages of nurses who actually perceived themselves as underweight, normal weight, overweight and obese were 65.0%, 66.4%, 64.1% and 19.4%, respectively.

Table 3  
Consistency analysis of BMI and body weight perception.

BMI	Body weight perception				Kappa	P
	Underweight N (%)	Normal weight N (%)	Overweight N (%)	Obese N (%)		
Underweight	26(65.0)	14(35.0)	0(0.0)	0(0.0)	0.357	< 0.001
Normal weight	24(9.2)	174(66.4)	63(24.0)	1(0.4)		
Overweight	0(0.0)	29(31.5)	59(64.1)	4(4.3)		
Obese	0(0.0)	6(9.7)	44(71.0)	12(19.4)		

One-way between subjects ANOVAs were conducted to compare the impact of overestimation, consistency and underestimation of body weight on physical and mental health as measured by the SF-36 sub-scales. There was a significant main effect for MH, VT and MCS at the  $p < 0.05$  level (see Table 4). Post hoc comparisons using the LSD test indicated that the mean scores for the underestimation group were significantly higher than the overestimation group on MH, VT and MCS. Underestimation group were significantly higher than the consistency group for MH, VT, MCS and GH. (see Table 4).

Table 4

Comparison between the overestimation, consistency and underestimation of body weight perception in SF-36 domain score.

QOL assessments (SF-36 domains), mean (SD)	Overestimation, mean $\pm$ SD, N = 82	Consistency, mean $\pm$ SD, N = 271	Underestimation, mean $\pm$ SD, N = 103	F	P
PF	88.35 $\pm$ 10.454	86.46 $\pm$ 13.375	86.26 $\pm$ 14.310	0.75	0.473
RP	70.43 $\pm$ 35.383	74.72 $\pm$ 35.124	80.83 $\pm$ 32.123	2.174	0.115
BP	85.56 $\pm$ 17.527	85.16 $\pm$ 17.816	88.38 $\pm$ 17.115	1.271	0.282
GH	64.45 $\pm$ 13.449	63.43 $\pm$ 13.286	67.23 $\pm$ 14.682a	2.898	0.056
VT	59.76 $\pm$ 15.008	61.75 $\pm$ 14.687	67.09 $\pm$ 14.927ab	6.693	<b>0.001</b>
SF	78.35 $\pm$ 18.742	80.03 $\pm$ 16.790	83.86 $\pm$ 17.206	2.683	0.069
RE	79.67 $\pm$ 35.042	79.46 $\pm$ 34.670	82.2 $\pm$ 32.944	0.246	0.782
MH	65.51 $\pm$ 15.379	66.11 $\pm$ 13.830	71.38 $\pm$ 13.966ab	5.878	<b>0.003</b>
PCS	77.20 $\pm$ 15.227	77.44 $\pm$ 14.546	80.67 $\pm$ 15.096	1.978	0.140
MCS	71.81 $\pm$ 16.808	72.84 $\pm$ 15.604	77.17 $\pm$ 16.156ab	3.397	<b>0.034</b>
a Comparison of underestimation vs. consistency of body weight perception significant at P < 0.05.					
b Comparison of underestimation vs. overestimation of body weight perception significant at P < 0.05.					
PCS: the physical component summary.					
MCS: the mental component summary.					

## Discussion

### Main finding of this study

In our study, there was a significant difference between BMI and BWP in Chinese nurses. 40.6% of our respondents didn't correctly identify their weight status. Married nurses were more likely than single nurses to overestimate their actual weight status. No associations were found between accuracy of BWP and age, education, per-capital disposable income. Nurses who underestimated their weight status reported higher quality of life scores in some sub-scale of SF-36 than nurse who correctly/ over-estimated their weight status.

### What is already known on this topic

Existing US research reported that 49 % of overweight paediatricians didn't identify their weight status correctly. Another UK research reported that 32.5% of nurses identify their weight status incorrectly. Previous studies have found that accuracy of BWP was associated with age, education and per-capital disposable income.<sup>15-17</sup> Existing studies stated that obesity can lead to psychological, social, and medical problems that may negatively affect QoL.<sup>18,19</sup>

### What this study adds

This was the first study to to examine Chinese healthy nurses' misconceptions of weight status. The rate of nurses' interceptions of weight status was 40.6%, lower than other study from US,<sup>20</sup> but higher than other study from UK.<sup>21</sup> The different rates of weight status misconception described by these studies may be explained by diversity in sample characteristics. However, nurse were health professionals, whose misconception of their own body weight could effect their identification of overweight patients.<sup>21</sup> Thus correctly identification of body weight should be one of the basic skills of nurses to help patients with weight management.

We found that married nurses were more likely than single nurses to overestimate their actual weight status, which may be influenced by the weight labeling from their partners. Recent a study has pointed that the experience of weight labeling (i.e., merely being told one is "too fat" by others) might influence the self-perception of body weight status.<sup>22</sup> Moreover their partners' weight labeling may likely originate in the stereotypical image of slim girls. Married nurse had more chances to be told they are fat by partners in this traditional image. It is logical that married nurse easier to overestimate their body weight status than single nurses.

Previous studies have found that accuracy of BWP was associated with age, education and per-capital disposable income.<sup>15-17</sup> These associations were not revealed in our 456 patients. We expect that variations in study design and participants' demographic characteristics might be the reasons for the discrepancy.

The prevalence of body weight underestimation was 0.0%, 9.2%, 31.5%, and 80.6%, respectively, in the successive BMI groups. Compared with underweight and normal weight nurses, overweight and obese nurses were easier to underestimate their body weight. 76.7% of the nurse in underestimation group were overweight and obese. 95.12% of the nurse in overestimation group were underweight and normal weight. Additionally, We also found that a mismatch exists between BMI and BWP, consistent with previous studies.<sup>21,23</sup> Misconception of body weight is therefore likely to be an important consideration for understanding the effects of underweight, overweight and obesity in China.

Some studies stated that obesity can lead to psychological, social, and medical problems that may negatively affect QoL.<sup>18,19</sup> Interestingly, our study found that nurse who underestimated their weight status reported higher quality of life scores in some sub-scale of SF-36 than nurse who correctly/over-estimated their weight status. Since nurse who underestimated their weight status didn't recognize the association of being overweight to an unhealthy condition, with consequent better scores on the evaluation of MH, VT, MCS and GH domains. But nurse who overestimated their weight status considered they are overweight/obesity, which lead to a worse scores on some domains of SF-36.

### Limitations of this study

A major limitation of this research was its cross-sectional design, which makes causality was not able to be determined. Second, a single question was used to assessed the BWP, which may be inadequate for describing body image. Third, only age, education, marital status and yearly income were considered in assessing the BWP association.

## Conclusions

Our study showed that a discrepancy exists between BMI and BWP. Married women were more likely than single women to overestimate their weight. Women who overestimate their body weight with a lower mental health, vitality and mental component summary scores, GH. Thus, Interventions should be designed to help nurse improve weight management awareness and increase their awareness of actual weight categories, thereby contributing to label themselves and patients as underweight, normal weight, overweight or obese correctly, and in turn, giving reasonable eating habits and physical activities health education.

## Declarations

### Ethical Approval and Consent to participate

The participants provided written, informed consent. Academic and Ethics Committee of Affiliated Haian Hospital of Nantong University, China, reviewed and approved this study.

### Consent for publication

Not applicable.

### Availability of supporting data

Data is available upon request to corresponding authors.

### Competing interests

The authors have no conflict of interest regarding this study.

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### Authors' contributions

Study design: Xu Wang, Xiaohua Yang. Data collection: Xu Wang, Xiaohua Yang. Data analysis: Xu Wang, Xiaohua Yang. Study supervision: Hongmei Chu, Chunyan Ge. Manuscript writing: Xu Wang, Hongmei Chu. Critical revisions for important intellectual content: Hongmei Chu, Chunyan Ge. All authors read and approved the final manuscript.

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