

# Body Mass Index, Subjective Body Shape, and Suicidal Ideation Among Community-Dwelling Korean Adults

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## Research

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# Abstract

**Background:** Studies examining the combination of objective and subjective body shape and its association with suicidal ideation have not been well investigated among different age groups. Therefore, this study was aimed to examine the above association among Korean adults, stratified by developmental stages.

**Methods:** Using a nationally representative data from the 2017 Korean Community Health Survey, 222,037 participants aged 19 or over were included in this study. A dependent variable was measured as having a suicidal ideation or not (1=yes, 0=no). With body mass index (BMI) and subjective body shape measures, seven categories were created (1=underweight-skinny, 2=underweight-normal/fat, 3=healthyweight-skinny, 4=healthyweight-normal, 5=healthyweight-fat, 6=overweight-skinny/normal, 7=overweight-fat). A multivariate logistic regression was conducted in each age group.

**Results:** Adjusted for covariates, overweight-fat (OR=1.183,  $p<.01$ ) young-aged adults, underweight-skinny (OR=1.322,  $p<.05$ ) middle-aged adults, and healthyweight-fat (OR=1.193,  $p<.05$ ) older adults were more likely to have suicidal ideation than healthyweight-normal counterparts.

**Conclusions:** Results suggest that the association between the combination of objective and subjective body shape and suicidal ideation is different by developmental stages. Therefore, this difference should be considered when developing suicide prevention interventions by developmental stages.

## Background

Previous studies have shown that body mass index is associated with suicidal risk [1–3]. Overall, overweight people are more likely to have depression, high stress level, and suicidal ideation than healthyweight people [1, 4–6]. In addition, several studies have shown that being underweight is associated with high risk of having suicidal ideation [7–9].

Apart from body weight, some researchers found that perceived body shape is a risk factor for mental disorder [10–14]. When adolescents perceived their body is skinny or fat, their stress and depression levels increased [15]. In addition, when college students were more satisfied with their body image, their subjective well-being was high [16].

Taking both objective and subjective body shape into account, several studies have examined the association between body shape discordance and mental health outcomes [13–14, 17–19]. When objective body weight and subjective body shape were not consistent, people were more likely to have depression and suicidal ideation. According to Seo et al. [20], young-aged men who perceived them as fatter than their actual body weight and middle-aged men who perceived them as slimmer than their actual body weight had the highest depression level. Moreover, Shin et al. [21] found that people who are actually underweight but perceive themselves as fatter are more likely to have depression than those who are actually overweight but perceive themselves as slimmer. Contrary to the findings that body shape

discordance is harmful for mental health, some study findings showed that people also have low quality of life or depression even actual body weight and subjective body shape matched (i.e. underweight-skinny or overweight-fat) [22–23].

However, the ideal standard of body shape may differ depending on developmental stages. Generally, younger people are more interested in their appearance and more sensitive to their subjective body shape than older people [24]. For example, young adults prefer skinny body shape due to the increase in social media use, and often stigmatize themselves as “a loser” when they perceive themselves as fat. In contrast, older adults become concerned about their health when they lose weight for no reason.

Although existing studies have revealed the association between body mass index, subjective body shape, and mental health outcomes, most studies were limited to adolescents or younger age groups, therefore, it was hard to compare above association by different age groups. Therefore, this study was aimed to examine the association between body mass index, subjective body shape, and suicidal ideation among Korean adults using the 2017 Korean Community Health Survey. More specifically, this study examined the above association according to different age groups (young-aged adults, middle-aged adults, and older adults) in order to suggest different suicide prevention strategies.

## Methods

### Data

Data for this study came from the 2017 Korean Community Health Survey (KCHS), a nationally representative survey conducted by the Korea Centers for Disease Control and Prevention (<http://chs.cdc.go.kr>). Study sample was selected with complex sampling design, first stratified by 253 communities where health centers are located. Then, the type of residence (apartment, house) was sampled via probability proportional to size for county units. The surveyed population was limited to residents aged 19 years or older. This community-based survey included information about socio-demographics, health status, and healthcare utilization. The KCHS was administered through Computer Assisted Personal Interviewing (CAPI), conducted by trained face-to-face interviewers [25]. In 2017, a total of 228,381 adults from 253 communities completed the interview. After listwise deletion of cases with missing values, 222,037 adults remained for empirical analyses. To compare the age group differences, the sample was divided into young-aged adults (N = 99,831), middle-aged adults (N = 84,913), and older adults (N = 37,293).

## Measures

### Suicidal Ideation

Suicidal ideation was measured based on a question, “During the last 12 months, did you ever think about suicide?” The response was dichotomized (1 = yes, 0 = no).

# Body Shape Categories

Body shape categories were measured with body mass index (BMI) and subjective body shape. First, based on the BMI (body weight divided by the height squared) classification, three categories were determined: (a) underweight ( $\text{BMI} < 18.5 \text{ kg/m}^2$ ), (b) healthyweight ( $18.5 \leq \text{BMI} < 25.0 \text{ kg/m}^2$ ), and (c) overweight ( $\text{BMI} \geq 25.0 \text{ kg/m}^2$ ). Second, subjective body shape was assessed with five response options, and three categories were determined: (a) skinny (very skinny/skinny), (b) normal (normal), and (c) fat (fat/very fat). Finally, using both BMI and subjective body shape measures, seven categories were created (1 = underweight-skinny, 2 = underweight-normal/fat, 3 = healthyweight-skinny, 4 = healthyweight-normal (reference), 5 = healthyweight-fat, 6 = overweight-skinny/normal, 7 = overweight-fat) [23].

## Covariates

In this study, sex (1 = female), age (number of years), education (less than elementary school graduate, middle school graduate, high school graduate, college and more (reference group)), monthly household income ( $< \$1,000$ ,  $< \$2,000$ ,  $< \$3,000$ ,  $< \$4,000$ ,  $< \$5,000$ ,  $< \$6,000$ ,  $\geq \$6,000$  (reference group)), living arrangement (1 = living alone), and working status (1 = employed) were included as socio-demographic covariates.

Several health-related covariates were also included. Self-rated health was dichotomized as (1 = fair/poor, 0 = excellent/very good/good). Depression was measured with the Patient Health Questionnaire-9 (PHQ-9) [26]. The PHQ-9 score ranged from 0–27, and the cronbach's alpha was .814. Drinking status was dichotomized as (1 = current drinker), and smoking status was dichotomized as (1 = current smoker). If respondents tried to lose weight or to keep from gaining weight, weight control practice was dichotomized as (1 = yes). If respondents did at least 20 minutes of vigorous activity more than three times a week, or did at least 30 minutes of moderate activity more than five times a week, physical activity was dichotomized as (1 = yes).

## Statistical Analysis

In this study, analyses were conducted separately for each age group (young-aged adults, middle-aged adults, and older adults). For the descriptive analyses, means (M) and standard deviation (SD) were used to assess the sample characteristics. One-way ANOVA and chi-square tests were conducted to evaluate the age group differences in descriptive statistics. Then, a multivariate logistic regression was used to investigate the association between body shape categories and suicidal ideation while controlling for covariates. All statistical analyses were based on weighted data which accounted for complex sample survey design, using SPSS version 21.

## Results

### Descriptive Statistics

Table 1 contains descriptive statistics for the study sample. To examine age group differences, age group was divided into three based on developmental stages (young-aged adults: 19–44 years old, middle-aged adults: 45–64 years old, and older adults: 65 years and over). Suicidal ideation was most prevalent among older adults (11.0%), while it was less prevalent among young-aged adults (5.3%). As for body shape categories, the majority of study participants were included in healthyweight-normal category and the minority of them were included in underweight-normal/fat category in all age groups. All study variables were significantly different by age groups.

Table 1  
Sample Characteristics by Age Group

Variables	Mean/W%(SE%)				P-value
	All (N = 222,037)	Young-aged adults (N = 99,831)	Middle-aged adults (N = 84,913)	Older adults (N = 37,293)	
Suicidal ideation (yes)	6.8%	5.3%	6.7%	11.0%	***
Body shape discordance					***
Underweight-skinny	3.7%	5.0%	1.8%	4.3%	
Underweight-normal/fat	1.2%	2.0%	0.4%	0.7%	
Healthyweight-skinny	12.2%	10.9%	11.0%	18.6%	
Healthyweight-normal (ref.)	38.8%	37.6%	39.9%	39.7%	
Healthyweight-fat	16.5%	17.8%	17.5%	10.6%	
Overweight-skinny/normal	4.7%	3.0%	5.3%	7.5%	
Overweight-fat	22.9%	23.6%	24.0%	18.7%	
Sex (female)	49.9%	48.0%	50.0%	54.3%	***
Education					***
Less than elementary school graduate	12.3%	0.2%	8.9%	52.0%	
Middle school graduate	8.4%	1.2%	12.9%	17.2%	
High school graduate	37.6%	39.4%	43.0%	20.3%	
College and more (ref.)	41.8%	59.2%	35.2%	10.5%	
Monthly household income					***
<\$1,000	10.3%	3.2%	6.4%	38.2%	
<\$2,000	12.1%	7.7%	12.0%	24.4%	
<\$3,000	17.1%	18.1%	16.9%	15.3%	
<\$4,000	18.0%	21.5%	18.0%	8.8%	
<\$5,000	15.2%	18.2%	16.1%	5.1%	
<\$6,000	10.1%	12.1%	10.9%	2.9%	
≥\$6,000 (ref.)	17.1%	19.2%	19.8%	5.4%	

Variables	Mean/W%(SE%)				P-value
	All (N = 222,037)	Young-aged adults (N = 99,831)	Middle-aged adults (N = 84,913)	Older adults (N = 37,293)	
Living arrangement (Living alone)	10.0%	8.1%	8.1%	19.0%	***
Working status (yes)	65.1%	69.8%	75.0%	29.7%	***
Self-rated health (fair/poor)	14.4%	5.3%	13.8%	39.8%	***
Depression (0–27)	2.1(0.0)	2.1(0.0)	1.8(0.0)	2.7(0.0)	***
Drinking status (current drinker)	76.1%	87.0%	76.1%	46.6%	***
Smoking status (current smoker)	20.4%	23.8%	21.3%	9.3%	***
Weight control practice (yes)	68.3%	75.5%	68.7%	48.0%	***
Physical activity (yes)	22.4%	23.4%	23.5%	17.1%	***

\*  $P < .05$ , \*\* $P < .01$ , \*\*\*  $P < .001$ ; W%=weighted %; SE%=standard error %; p-value = ANOVA or  $\chi^2$  test

## Logistic Regression Results

Table 2 contains multivariate logistic regression results by age groups. Among young-aged adults, overweight-fat respondents were more likely to have suicidal ideation than healthyweight-normal respondents (OR = 1.183,  $p < .01$ ). Among middle-aged adults, underweight-normal respondents were more likely to have suicidal ideation than healthyweight-normal respondents (OR = 1.322,  $p < .05$ ). The odds of having suicidal ideation was 119.3% higher for healthyweight-fat older adults than healthyweight-normal older adults (OR = 1.193,  $p < .05$ ).

As for covariates, sex, education, self-rated health, depression, and smoking status were significantly associated with suicidal ideation in all age groups.

Table 2  
Multivariate Logistic Regression Results

Variables	Suicidal ideation, OR(95% CI)			
	All (N = 222,037)	Young-aged adults (N = 99,831)	Middle-aged adults (N = 84,913)	Older adults (N = 37,293)
Body shape discordance (Healthyweight-normal = ref.)				
Underweight-skinny	1.161(1.027, 1.313)*	1.194(0.981, 1.454)	1.322(1.018, 1.717)*	1.164(0.968, 1.400)
Underweight-normal/fat	1.101(0.888, 1.365)	0.997(0.732, 1.358)	1.324(0.879, 1.996)	1.263(.860, 1.853)
Healthyweight-skinny	1.056(0.975, 1.143)	1.138(0.966, 1.341)	1.069(0.936, 1.222)	1.104(0.983, 1.238)
Healthyweight-fat	1.120(1.043, 1.203)**	1.105(0.977, 1.250)	1.036(0.924, 1.222)	1.193(1.038, 1.371)*
Overweight-skinny/normal	0.973(0.854, 1.109)	0.692(0.470, 1.019)	0.926(0.742, 1.155)	1.142(0.962, 1.356)
Overweight-fat	1.136(1.061, 1.216)***	1.183(1.050, 1.332)**	1.080(0.968, 1.206)	1.098(0.969, 1.244)
Sex (female)	1.400(1.319, 1.486)***	1.604(1.430, 1.793)***	1.275(1.149, 1.415)***	1.141(1.031, 1.263)*
Age (years)	1.005(1.003, 1.007)***	1.029(1.022, 1.035)***	0.990(0.982, 0.999)*	0.999(0.991, 1.007)
Education (College and more = ref.)				
Less than elementary school graduate	1.383(1.254, 1.526)***	3.375(1.923, 5.923)***	1.697(1.451, 1.986)***	1.464(1.196, 1.792)***
Middle school graduate	1.407(1.276, 1.552)***	2.622(1.961, 3.505)***	1.260(1.089, 1.459)**	1.351(1.080, 1.689)**
High school graduate	1.295(1.214, 1.382)***	1.389(1.264, 1.526)***	1.227(1.096, 1.374)***	1.201(0.965, 1.496)
Monthly household income (≥\$6,000 = ref.)				
<\$1,000	1.950(1.740, 2.185)***	2.232(1.765, 2.823)***	2.295(1.908, 2.759)***	1.151(0.904, 1.463)
<\$2,000	1.607(1.444, 1.788)***	1.648(1.368, 1.984)***	1.963(1.668, 2.310)***	0.802(0.624, 1.031)
<\$3,000	1.437(1.297, 1.592)***	1.528(1.304, 1.789)***	1.541(1.316, 1.803)***	0.785(0.601, 1.026)

Variables	Suicidal ideation, OR(95% CI)			
	All (N = 222,037)	Young-aged adults (N = 99,831)	Middle-aged adults (N = 84,913)	Older adults (N = 37,293)
<\$4,000	1.222(1.102, 1.355) <sup>***</sup>	1.219(1.044, 1.424) <sup>*</sup>	1.310(1.112, 1.543) <sup>**</sup>	0.735(0.548, 0.987) <sup>*</sup>
<\$5,000	1.101(0.985, 1.232)	1.108(0.939, 1.307)	1.147(0.967, 1.362)	0.789(0.570, 1.094)
<\$6,000	1.146(1.009, 1.300) <sup>*</sup>	1.146(0.957, 1.372)	1.171(0.961, 1.427)	1.013(0.706, 1.452)
Living arrangement (Living alone)	1.026(0.954, 1.103)	0.969(0.830, 1.132)	1.173(1.042, 1.321) <sup>**</sup>	1.051(0.944, 1.171)
Working status (yes)	0.962(0.910, 1.016)	0.848(0.766, 0.939) <sup>**</sup>	0.966(0.878, 1.063)	0.883(0.800, 0.974) <sup>*</sup>
Self-rated health (fair/poor)	1.689(1.587, 1.798) <sup>***</sup>	1.780(1.554, 2.038) <sup>***</sup>	1.747(1.585, 1.925) <sup>***</sup>	1.625(1.479, 1.787) <sup>***</sup>
Depression (0–27)	1.344(1.334, 1.353) <sup>***</sup>	1.370(1.354, 1.387) <sup>***</sup>	1.380(1.362, 1.399) <sup>***</sup>	1.278(1.262, 1.293) <sup>***</sup>
Drinking status (current drinker)	1.209(1.137, 1.286) <sup>***</sup>	1.085(0.948, 1.241)	1.227(1.116, 1.349) <sup>***</sup>	1.122(1.026, 1.227) <sup>*</sup>
Smoking status (current smoker)	1.334(1.252, 1.443) <sup>***</sup>	1.153(1.019, 1.305) <sup>*</sup>	1.342(1.194, 1.507) <sup>***</sup>	1.390(1.210, 1.596) <sup>***</sup>
Weight control practice (yes)	1.086(1.027, 1.148) <sup>**</sup>	1.112(0.994, 1.244)	1.042(0.954, 1.138)	1.091(0.996, 1.194)
Physical activity (yes)	1.049(0.985, 1.116)	1.057(0.953, 1.174)	1.049(0.952, 1.155)	1.029(0.905, 1.171)
Nagelkerke R <sup>2</sup>	.298	.296	.300	.290
* $P < .05$ , ** $P < .01$ , *** $P < .001$ ; OR = Odds Ratio; CI = Confidence Interval				

## Discussion

This study was aimed to examine the association between body mass index, subjective body shape, and suicidal ideation among Korean adults by age groups. Adjusted for covariates, results showed that the association between body shape categories and suicidal ideation was different by age groups.

Among young-aged adults (age 19–44), overweight-fat people were more likely to have suicidal ideation. This result is consistent with previous findings with relatively young population [22, 27–28]. According to Yazdani et al. [28], body image defects caused by obesity can have negative effects on psychological

well-being. In addition, negative social gaze on obese population and life dissatisfaction can lead to depression, which is a major risk factor for suicide [27].

Among middle-aged adults (age 45–64), underweight-skinny people were more likely to have suicidal ideation. This result is similar to findings that people who are underweight or perceive themselves as skinny have worse mental health than healthyweight people [7, 11, 20, 29]. According to Coin et al. [30], malnutrition is often associated with being underweight, resulting in decreased immunity, anemia, osteoporosis, muscle loss, etc. Middle-aged adults who are susceptible to above risks have low level of health-related quality of life, which is associated with suicidal ideation [31].

Among older adults (age 65+), healthyweight-fat people were more likely to have suicidal ideation. Indeed, elderly obesity is known as a risk factor for cardiovascular disease, cancer, and mortality [32]. Therefore, if older adults perceive them as fat even though they have healthyweight, it is likely to lead to health concerns and poor quality of life, which can be associated with suicidal ideation.

Study findings suggest that not only the discrepancy between objective and subjective body perception (i.e. healthyweight-fat category), but also people out of the normal range of body weight defined by the society (i.e. underweight-skinny, overweight-fat) have suicidal risk. In other words, people expect to be belonged to the normal category, but being in abnormal category makes them frustrated and lose self-esteem. This is in line with Etcoff's [33] finding that normal body shape is preferred over very skinny or very fat body shape.

In socio-cultural contexts, people form their own values and norms about body shapes, and individual characteristics such as self-esteem can be associated with them [34]. Nevertheless, negative views or perceptions about the body shape caused by appearance pressuresism in Korean society [35] results in negative emotional reactions such as sadness and loneliness when the desire for belonging to normal category is frustrated. And when self-esteem is hurt, people feel worthlessness and self-disappointment that it is difficult for them to have rational thoughts [35].

Another suggestion should be providing different weight programs to prevent suicidal ideation by different age groups. For young-aged and older adults who are sensitive to gaining weight, weight control programs should be implemented more effectively. Providing programs which can show how to manage healthy body shape can be helpful for middle-aged adults. In addition, these programs should go hand in hand with an effort to improve and change negative awareness on body shapes. In sum, elevating self-esteem by relieving obsessive thoughts and escaping from socio-cultural pressure about body shapes are required.

There are some limitations in this study that should be noted. First, suicidal ideation was measured with a single questionnaire, therefore the level of suicidal ideation could not be identified in detail. Second, when determining body shape categories, a sample size was very small in underweight-normal/fat group. Therefore, the results should be interpreted with caution. Lastly, the 2017 KCHS is a cross-sectional data, therefore the causal relationship could not be explored.

Although this study has several limitations, this study has strengths. First, this study investigated the relationship between body mass index, subjective body shape, and suicidal ideation among Korean adults using a nationally representative sample. Therefore, the findings from this study are generalizable. Second, studies on body shapes and suicidal ideation were often examined among adolescents or younger age groups, but this study examined this association in older age groups as well. Third, this study examined the age group differences, which could suggest tailored suicide prevention programs according to age groups.

## Conclusion

To conclude, this study can highlight several findings. First, the association between body mass index, subjective body shape, and suicidal ideation are different among different age groups. Second, the discrepancy between objective and subjective body shape increases suicidal risk (i.e. healthyweight-fat older adults). Third, people out of the normal range of body shape defined by the society are more likely to have suicidal ideation (i.e. overweight-fat young-aged adults, underweight-skinny middle-aged adults). Therefore, different suicide prevention strategies should be implemented based on these findings.

## Abbreviations

BMI: Body Mass Index

OR: Odds Ratio

KCHS: Korean Community Health Survey

CAPI: Computer Assisted Personal Interviewing

PHQ-9: Patient Health Questionnaire-9

M: Mean

SD: Standard Deviation

ANOVA: Analysis of Variance

## Declarations

### **Ethics approval and consent to participate:**

This study used secondary dataset, “2017 Korean Community Health Survey” which is publicly available.

### **Consent for publication:**

Not applicable

## Availability of data and materials:

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

## Competing interests:

The authors declare that they have no competing interests

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## Authors' contributions:

CY analyzed and interpreted the data, and was a major contributor in writing the manuscript. YK provided critical feedback. JL conceptualized and designed the study. All authors read and approved the final manuscript.

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