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ORIGINAL ARTICLE

The relationship between body fat mass and erectile dysfunction in Korean men: Hallym Aging Study

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The aim of this study was to assess the relationship between body fat mass (BFM) and erectile dysfunction (ED) in Korean men. This study was a cross-sectional study using data on 208 men (the mean age = 67.4 ± 8.2). ED was diagnosed by the International Index of Erectile Function (IIEF)-5 and body fat percentage (BF%) was quantified with bioelectrical impedance. BF% was divided into quintiles (quintile 1: ⩽20.5%, quintile 2: 20.6–23.2%, quintile 3: 23.3–25.8%, quintile 4: 25.9–28.8%, quintile 5: ⩾28.9%). Using subjects with quintile 3 of BF% as reference, the adjusted odds ratios of subjects with the lowest quintile of BF% and with the highest quintile were 9.29 (95% CI: 2.29–37.72) and 4.99 (95% CI: 1.37–18.09), respectively. This study showed that BFM and ED had a U-shaped relationship in Korean men. These findings suggest that not only obesity but also a low BFM may be a risk factor of ED in Asians.
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Keywords: body fat mass; erectile dysfunction; obesity; low body weight

Introduction

Erectile dysfunction (ED) is defined as the persistent inability to attain or maintain a penile erection adequate for satisfactory sexual intercourse[1] and is an important cause of impairment in the quality of life for men.[2] The prevalence of ED increases with age. According to the Massachusetts Male Aging Study,[3] the prevalence of complete ED tripled from 5 to 15% between the ages of 40 and 70 years. Ahn *et al.*[4] reported that the prevalence of ED based on the International Index of Erectile Function (IIEF)-5 was 32.4% among Korean men aged 40–79 years and was increased rapidly in men 60 years or older (40–49: 17.0%, 50–59: 29.6%, 60–69: 62.0%, 70–79: 84.4%). As Korea has been progressing rapidly toward an aged society, ED is expected to be more common and emerge as one of the big public health problems among the elderly.

It was reported that ED was related to traditional risk factors of coronary artery disease such as metabolic syndrome, dyslipidemia, hypertension, type 2 diabetes, smoking and obesity.[5] Esposito *et al.*[6] showed that lifestyle changes including a reduced calorie diet and increased exercise led to improvement of erectile function in obese men. Endothelial dysfunction, which is an early stage of atherosclerotic vascular disease, is considered to be the most important mechanism of ED.[7] The penile artery is very sensitive to oxidative stress and

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atherosclerotic change due to greater amounts of endothelium relative to the small size of the artery. This explains why ED often precedes coronary artery disease by 2–3 years, suggesting ED is an early marker of coronary artery disease.[8,9]

Increased body mass index (BMI) was reported to be related to an increased risk of ED in some studies,[10,11] but not in others.[4,12–15] There might be several reasons for these inconsistencies. First, the relationship between body fat mass (BFM) and risk of disease may be different according to race and ethnicity. The World Health Organization suggested a lower cutoff of BMI for diagnosis of obesity in Asian populations because risk of obesity-related diseases was elevated at a lower BMI in Asians compared to Caucasians.[16] There are few studies reporting that obesity is independently related to an increased risk of ED in Asia.[4,13–15] A study performed in Hong Kong demonstrated the possibility that the relationship between BMI and ED risk was not linear but U-shaped.[17] Second, there were differences in the socio-demographic characteristics of the study subjects among previous studies. The risk of ED increases rapidly after the age of 60 years, but many studies did not capture the aged men sufficiently. Some studies were not population-based but hospital-based studies.[15] Third, only BMI was available for the measurement of BFM in most epidemiological studies. However, BMI is not suitable as a marker of obesity in the geriatric population because decrease of height and loss of muscle mass accompany geriatric obesity.[18] Recruiting sufficient subjects from community-based populations including men aged 60 years or older and using body fat percentage (BF%) as a marker of obesity will aid in solving these issues.

We assessed the relationship between BFM and ED in Korean men that participated in the Hallym Aging Study (HAS) in 2004. In this study, BF% measured by bioelectrical impedance analysis (BIA) was used as a surrogate of BFM, and ED was diagnosed by the Korean version of IIEF-5.

Methods

Study subjects

HAS is a population-based study on elderly Koreans dwelling in the suburban city, Chuncheon and was planned to investigate which factors relate to the quality of life among the elderly. The first wave survey of HAS was conducted in 2003 and the 2nd wave, an in-depth clinical study was repeated in 2004 (Figure 1). Chuncheon city is divided into 1408 areas based on 2000 population census and 200 areas were randomly selected among these. After subjects were stratified into eup (subdivision of city), myeon (subdivision of city) and dong (subdivision of eup or myeon) according to the proportion of population aged 45 years or older, a study population for the first wave survey was selected by systematic sampling. In all, 30% of the subjects were sampled from individuals aged 45–64 years, and 70% were sampled from individuals aged 65 years or older. Participants of the first wave survey in 2003 were 1510 individuals. These participants were invited to the second wave from January to July 2004. Here, 592 individuals were excluded due to refusal, absence, change of residence, no contact and/or death. Finally, 918 individuals including 384 men participated in the second wave survey of HAS. In all 129 individuals who were not evaluated for erectile function and/or body composition and 47 individuals with a previous history of heart disease, stroke or cancer, currently in treatment for thyroid disease or depression and with active tuberculosis, empyema or tumor on chest X-ray were further excluded. Finally, the data of 208 men were available for the final analysis.

Data collection, questionnaires and measurements

All protocols and procedures were approved by the Hallym University's institutional review board, and informed consent was obtained from all study subjects. This investigation was composed of questionnaires, anthropometric measurements and laboratory tests. Questionnaires were administered face-to-face by trained interviewers. Anthropometric measurements and laboratory tests were performed by a clinical team of Chuncheon Sacred Heart Hospital. Study subjects were asked to abstain from all food from 2100 hours before investigation.

Questionnaires. Age, marital status, smoking status, alcohol drinking, regular exercise, past/current medical history, geriatric depression scale (GDS) and IIEF-5 were obtained from structured questionnaires.

The GDS developed by Yesavage *et al.*[19] was used for the measurement of depressive mood. The GDS (score 0–30) was composed of 30-item questionnaires to be answered yes or no. We used the Korean version of GDS that was translated and validated by Jung *et al.*[20] They reported that the cutoff value of 18 was most optimal to detect depression (sensitivity 65.6%, specificity 64.9%) in Koreans. In this study, those with GDS scores $\geqslant$18 were classified as having depression.

The IIEF-5 that was developed by Rosen *et al.*[21] and was translated by Ahn *et al.*,[22] was used for the assessment of ED. IIEF-5 (score 5–25) consists of five questions which are scored on a five-point ordinal scale with lower values representing poorer erectile function. Ahn *et al.*[22] reported that the cutoff value of 17 was most optimal to diagnose ED (sensitivity 91.3%, specificity 86.3%) in Koreans. IIEF-5 cannot be used to classify men not engaging in sexual activity within the most recent 6 months. Fung

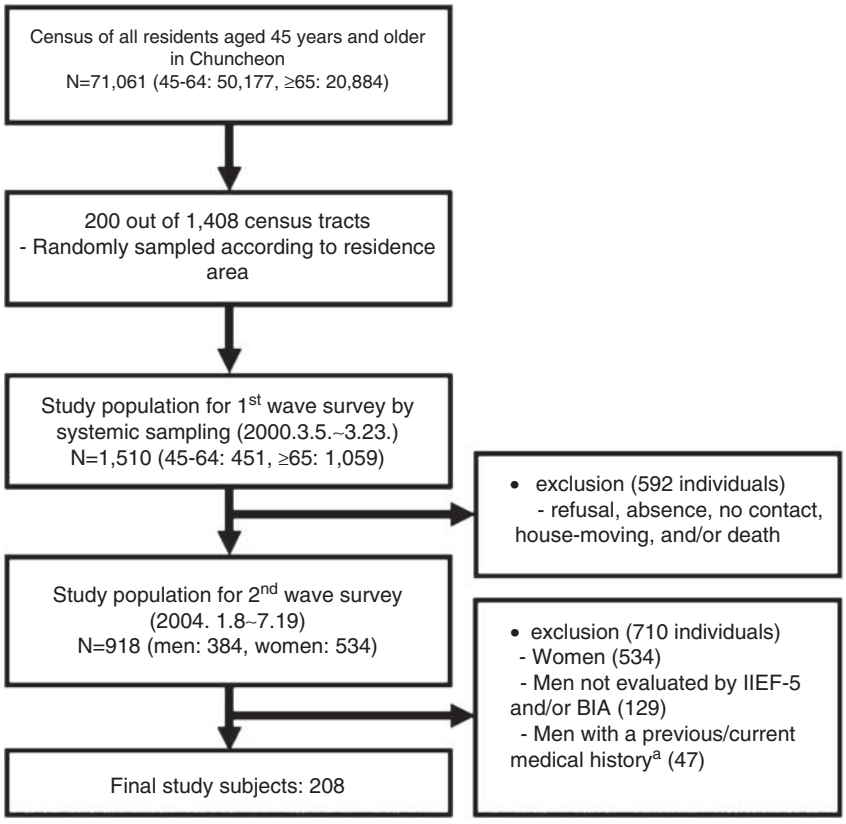

Figure 1 Study flow of the Hallym Aging Study. [a]Men with a previous/current medical history, individuals with a previous history of heart disease, stroke or cancer, currently in treatment for thyroid disease or depression and with active tuberculosis, empyema or tumor on chest X-ray. IIEF-5; 5-item version of the international index of erectile dysfunction, BIA; bioelectrical impedance analysis.

et al.[23] suggested that excluding sexually inactive men would underestimate severe ED as ED might be a prominent reason for sexual inactivity. Here, 29.8% of subjects of this study reported no sexual activity within the most recent 6 months. However, 85.5% of sexually inactive men reported that they had low confidence in getting and keeping an erection. Therefore, we did not exclude sexually inactive men in this study.

Anthropometric measurements and laboratory tests. Anthropometric measurements were performed with subjects wearing light clothing and no shoes. Quality control for all measurements was monitored regularly. The height was measured to the nearest 0.1 cm and weight to the nearest 0.1 kg in the upright position. The BMI was calculated as the body weight divided by the height squared ($kg\,m^{-2}$). Waist circumference was measured at the end of each subject's normal expiration to the nearest 0.1 cm at the level of the midpoint between the lower end of the 12th rib and the upper end of the iliac crest using anthropometric tape. The BF% was quantified with bioelectrical impedance (InBody 3.0, Biospace, Seoul, Korea). The resistances of arms, trunk and legs were measured at frequencies of 5, 50, 250 and 500 kHz with an eight-polar tactile-electrode impedance-meter. A set of externally derived BIA prediction equations was used to calculate the BF% according to age, gender, weight and resistance. The correlation coefficient between the InBody and DXA measurements was 0.93, and the mean error was 1.2% (95% CI: −4.6 to 7.1) according to a previous study.[24]

The systolic blood pressure and diastolic blood pressure were measured in the seated, rested subjects, using a standard protocol. Plasma glucose, total cholesterol (T-Chol), triglyceride (TG) levels and high-density lipoprotein cholesterol (HDL-C) were measured using an auto-analyzer (Hitachi 747; Hitachi, Tokyo, Japan). Low-density lipoprotein cholesterol (LDL-C) was calculated by the Friedwald equation (LDL-C = T-Chol–(HDL-C + TG/5)). Subjects with systolic blood pressure $\geqslant$ 140 mm Hg, with diastolic blood pressure $\geqslant$ 90 mm Hg, and/or in using antihypertensive medications were diagnosed as having hypertension. Subjects with fasting plasma glucose $\geqslant$ 126 mg per 100 ml and/or in treatment for previously diagnosed diabetes mellitus were diagnosed as having diabetes mellitus, and subjects with TG $\geqslant$ 200 mg per 100 ml, with LDL-C $\geqslant$ 160 mg per 100 ml, with HDL-C $\leqslant$ 40 mg per 100 ml, and/or in treatment for previously diagnosed dyslipidemia were diagnosed as having dyslipidemia.

Statistical analyses

Study subjects were classified into men with IIEF-5 $\geqslant$ 18, men with IIEF-5 $\leqslant$ 17, and men without sexual activity within the most recent 6 months. Demographic characteristics, anthropometric measures and laboratory results across ED categories were compared by one-way ANOVA and χ^2 test. BF% was primarily used as a surrogate of BFM in this study. For comparison, we also presented results of analyses in that BMI was included as an independent variable. We divided BF% (quintile 1: $\leqslant$20.5%, quintile 2: 20.6–23.2%, quintile 3: 23.3–25.8%, quintile 4: 25.9–28.8%, quintile 5: $\geqslant$28.9%) and BMI (quintile 1: $\leqslant 23.1\,kg\,m^{-2}$, quintile 2: 23.2–$24.4\,kg\,m^{-2}$, quintile 3: 24.5–$25.5\,kg\,m^{-2}$, quintile 4: 25.6–$27.0\,kg\,m^{-2}$, quintile 5: $\geqslant 27.1\,kg\,m^{-2}$) into quintiles for analysis because of the possibility of a U-shaped relationship with ED. The odds ratio (OR) for ED was calculated in each category of BF% or BMI using the multiple logistic regression analysis with adjustments for age, smoking status, alcohol drinking, exercise, hypertension, diabetes mellitus, dyslipidemia and depression. We did not include both BF% and BMI in a regression model at the same time to avoid multicollinearity that might develop due to the strong correlation between BF% and BMI ($r = 0.721$). The statistical analysis was performed with SPSS 13.0 for Windows (SPSS Inc., Chicago, IL, USA). *P*-values were two-tailed with statistical significance defined as <0.05.

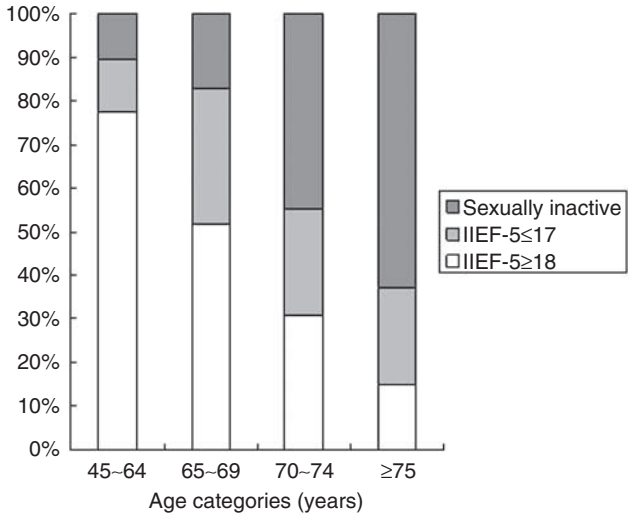

Figure 2 Prevalence of erectile dysfunction according to age groups. IIEF-5; 5-item version of the international index of erectile dysfunction.

Results

Men with IIEF-5 $\geqslant$ 18, men with IIEF-5 $\leqslant$ 17 and men without sexual activity within the most recent 6 months were 99 subjects (47.6%), 47 subjects

Table 1 General characteristics of the study population[a]

	Total (N = *208*)	*IIEF-5* $\geqslant$ *18* (N = *99*)	*IIEF-5* $\leqslant$ *17* (N = *47*)	*Sexually inactive* (N = *62*)
Age (years)	67.4 (8.2)	63.6 (8.1)	68.7 (6.3)	72.5 (6.2)
Married and living together (%)	95.1	95.9	97.7	91.8
Ex-smoker (%)[b]	44.7	35.4	44.7	59.7
Current smoker (%)	33.2	40.4	34.0	21.0
Current drinker (%)	61.5	61.6	63.8	59.7
Regular exercise (%)	24.0	31.3	14.9	19.4
History of hypertension (%)	21.3	19.4	21.7	22.2
History of diabetes mellitus (%)	12.1	11.3	19.6	7.3
History of dyslipidemia (%)	1.5	2.1	2.2	0.0
SBP (mm Hg)	136.4 (17.9)	134.8 (16.2)	138.5 (20.8)	137.5 (18.3)
DBP (mm Hg)	81.9 (11.3)	82.6 (11.3)	81.3 (12.8)	81.1 (10.2)
FPG (mg per 100 ml)	109.2 (33.0)	109.5 (34.0)	110.2 (34.7)	107.7 (30.2)
T-Chol (mg per 100 ml)	195.0 (32.1)	194.7 (31.4)	200.0 (30.2)	191.4 (34.8)
TG (mg per 100 ml)	176.9 (111.0)	186.8 (114.2)	164.6 (77.8)	169.5 (128.2)
HDL-C (mg per 100 ml)	50.5 (18.5)	48.6 (15.2)	55.3 (23.8)	50.0 (18.3)
LDL-C (mg per 100 ml)	109.1 (32.7)	108.8 (34.4)	111.8 (26.8)	107.4 (34.4)
GDS (score)[b]	12.0 (6.9)	8.9 (5.6)	14.7 (6.4)	15.3 (7.1)
Height (cm)	163.4 (6.9)	164.3 (6.6)	162.9 (6.0)	162.4 (7.8)
Weight (kg)	67.1 (9.1)	68.5 (7.6)	66.1 (9.4)	65.7 (10.7)
BMI ($kg\,m^{-2}$)	25.1 (2.8)	25.4 (2.2)	24.9 (3.2)	24.8 (3.2)
BF% (%)	24.5 (5.3)	24.0 (4.5)	24.3 (6.5)	25.5 (5.3)
WC (cm)	88.5 (7.5)	89.0 (6.2)	87.0 (8.9)	88.9 (8.2)

Abbreviations: BF%, body fat percentage; BMI, body mass index; DBP, diastolic blood pressure; FPG, fasting plasma glucose; GDS, geriatric depression scale; HDL-C, high-density lipoprotein cholesterol; IIEF-5, 5-item version of the international index of erectile dysfunction; LDL-C, low-density lipoprotein cholesterol; SBP, systolic blood pressure; T-Chol, total cholesterol; TG, triglyceride; WC, waist circumference.

[a]Continuous variables are expressed as mean (s.d.) and categorical variables are expressed as %.

[b]*P*-value <0.05 by χ^2 test or one-way ANOVA.

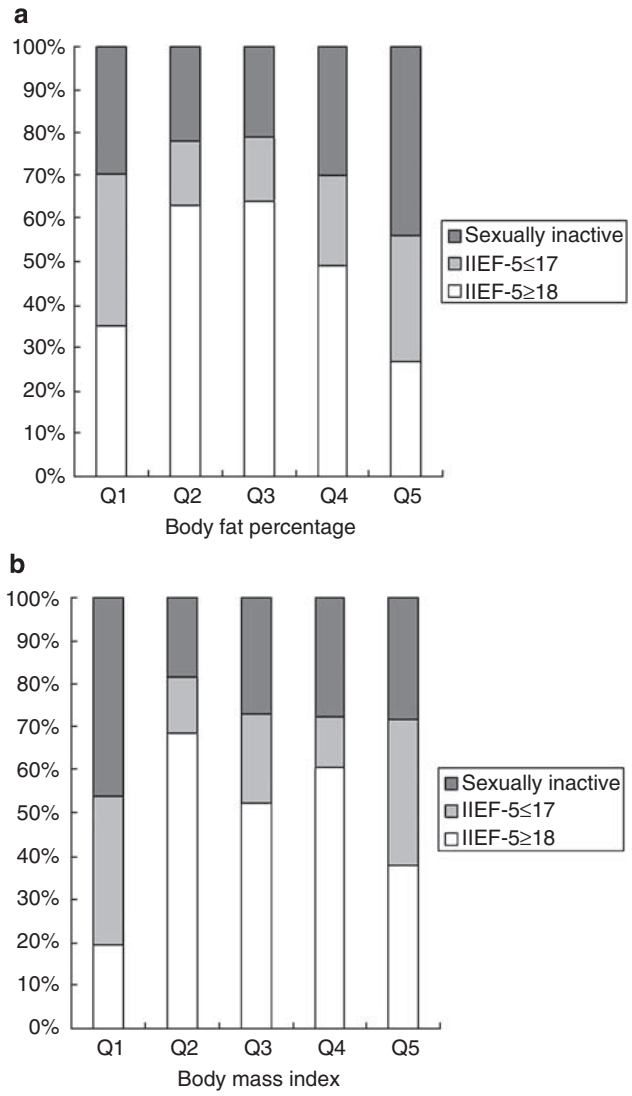

Figure 3 Prevalence of erectile dysfunction according to (**a**) body fat percentage and (**b**) body mass index. Body fat percentage Q1: $\leqslant$20.5%, Q2: 20.6–23.2%, Q3: 23.3–25.8%, Q4: 25.9–28.8%, Q5: $\geqslant$28.9%. Body mass index Q1: $\leqslant$23.1 kg m^{-2}, Q2: 23.2–24.4 kg m^{-2}, Q3: 24.5–25.5 kg m^{-2}, Q4: 25.6–27.0 kg m^{-2}, Q5: $\geqslant$27.1 kg m^{-2}. IIEF-5: 5-item version of the international index of erectile dysfunction.

(22.6%) and 62 subjects (29.8%), respectively. The proportion of men with normal erectile function decreased significantly with age (Figure 2). Men with IIEF-5$\leqslant$17 and men without sexual activity within the most recent 6 months had higher GDS scores and were more likely to be ex-smokers than men with IIEF-5$\geqslant$18. Significant differences of the other variables were not found across ED categories (Table 1).

Subjects with the lowest quintile or the highest quintile of BF% or BMI had a lower proportion of men with IIEF-5$\geqslant$18 and a higher proportion of men with IIEF-5$\leqslant$17 and men without sexual activity within the most recent 6 months compared to the other subjects (Figure 3a and b).

Multiple logistic regression analyses were performed to elucidate which variables were independently related to ED. In multivariate analyses after defining ED as IIEF-5$\leqslant$17 and sexual inactivity, risk of ED increased significantly in subjects with the lowest quintile (OR: 9.29 (95% CI: 2.29–37.72)) and with the highest quintile (OR: 4.99 (95% CI: 1.37–18.09)) of BF% compared to subjects with quintile 3 of BF% (Table 2).

When BMI was substituted for BF% in the regression model, subjects with quintile 2 of BMI had the lowest prevalence of ED. Using subjects with quintile 2 of BMI as reference ORs of quintile 1 and quintile 5 of BMI were 21.06 (95% CI: 4.19–105.73) and 6.61 (95% CI: 1.49–29.24), respectively (Table 2).

We also performed the same analyses after excluding sexually inactive men. The results did not change significantly excluding decreased significance of the OR of men with the highest quintile of BF% and the lowest prevalence of ED in men with quintile 4 of BMI (Table 3).

Discussion

We investigated the relationship between BFM and ED in Korean men aged 45 years or older. This study showed that BFM and ED had a U-shaped relationship in Korean men. This result agrees with Cheng *et al.*'s study,[17] which first demonstrated a U-shaped relationship between BMI and ED risk in Hong Kong. However, several different aspects exist between these two studies. The Hong Kong study diagnosed ED by a single-question, but we used standardized IIEF-5 questionnaires for diagnosis of ED. They measured BMI as a marker of BFM, but we measured BF% through BIA. Low BMI at an older age appears to be much more closely associated with loss of lean body mass than in young adults.[25] BMI may not properly represent BFM in the elderly. To capture populations with a high risk of ED, we assigned 70% of our study subjects to be men aged 65 years or older, so the subjects of this study are older than those of the Hong Kong study. The lowest ED prevalence occurred at a higher BMI in this study than Cheng *et al.*'s study.[17] This may also be due to different age distribution of the two studies. It has been reported that BMI associated with the lowest health risk is right-shifted in older populations.[26,27] In most previous studies[4,13–15] in Asia, obesity was reported to be not associated with the risk of ED. The possible reason for these findings is that the normal body-weight group and the low body-weight group were classified as a single group in those studies.

Though ED is developed by various factors, it is now widely accepted that 50–70% of organic ED is due to underlying vascular causes like atherosclerosis.[8,12,28] It was recommended that any men with ED who do not have an obvious cause such as trauma

Table 2 Effect estimates of obesity on the risk of erectile dysfunction[a]

Variables	*IIEF-5⩾18,* N *(%)*	*IIEF-5⩽17 or sexual inactivity,* N *(%)*	*Odds ratio (95% CI)*[b]
BF%			
Quintile 1 (⩽20.5%)	13 (13.1)	24 (22.0)	9.29 (2.29–37.72)
Quintile 2 (20.6–23.2%)	29 (29.3)	17 (15.6)	1.84 (0.55–6.13)
Quintile 3 (23.3–25.8%)	25 (25.3)	15 (13.8)	1.00 (Reference)
Quintile 4 (25.9–28.8%)	21 (21.2)	23 (21.1)	2.35 (0.68–8.04)
Quintile 5 (⩾28.9%)	11 (11.1)	30 (27.5)	4.99 (1.37–18.09)
BMI			
Quintile 1 (⩽23.1 kg m^{-2})	8 (8.1)	33 (30.3)	21.06 (4.19–105.73)
Quintile 2 (23.2–24.4 kg m^{-2})	26 (26.3)	12 (11.0)	1.00 (Reference)
Quintile 3 (24.5–25.5 kg m^{-2})	23 (23.2)	21 (19.3)	2.67 (0.64–11.23)
Quintile 4 (25.6–27.0 kg m^{-2})	26 (26.3)	17 (15.6)	2.08 (0.50–8.64)
Quintile 5 (⩾27.1 kg m^{-2})	16 (16.2)	26 (23.9)	6.61 (1.49–29.24)

Abbreviations: BF%, body fat percentage; BMI, body mass index; IIEF-5, International Index of Erectile Function-5.
[a]Erectile dysfunction includes IIEF-5⩽17 and sexual inactivity within the most recent 6 months.
[b]Adjusted by age, smoking status, alcohol drinking, exercise, hypertension, diabetes mellitus, dyslipidemia and depression.

Table 3 Effect estimates of obesity on the risk of erectile dysfunction[a] after excluding sexually inactive men

Variables	*IIEF-5⩾18,* N *(%)*	*IIEF-5⩽17,* N *(%)*	*Odds ratio (95% CI)*[b]
BF%			
Quintile 1 (⩽20.5%)	13 (13.1)	13 (27.7)	9.65 (1.67–55.79)
Quintile 2 (20.6–23.2%)	29 (29.3)	7 (14.9)	1.22 (0.24– 6.30)
Quintile 3 (23.3–25.8%)	25 (25.3)	6 (12.8)	1.00 (Reference)
Quintile 4 (25.9–28.8%)	21 (21.2)	9 (19.1)	2.14 (0.43–10.06)
Quintile 5 (⩾28.9%)	11 (11.1)	12 (25.5)	3.36 (0.66–17.18)
BMI			
Quintile 1 (⩽23.1 kg m^{-2})	8 (8.1)	14 (29.8)	14.09 (2.35–84.60)
Quintile 2 (23.2–24.4 kg m^{-2})	26 (26.3)	5 (10.6)	1.00 (Reference)
Quintile 3 (24.5–25.5 kg m^{-2})	23 (23.2)	9 (19.1)	1.31 (0.25–6.95)
Quintile 4 (25.6–27.0 kg m^{-2})	26 (26.3)	5 (10.6)	0.71 (0.12–4.17)
Quintile 5 (⩾27.1 kg m^{-2})	16 (16.2)	14 (29.8)	4.92 (0.96–25.34)

Abbreviations: BF%, body fat percentage; BMI, body mass index; IIEF-5, International Index of Erectile Function-5.
[a]Erectile dysfunction was defined as IIEF-5⩽17.
[b]Adjusted by age, smoking status, alcohol drinking, exercise, hypertension, diabetes mellitus, dyslipidemia and depression.

should be screened for vascular disease and have their blood glucose, lipids and blood pressure measured.[29] Endothelial dysfunction is known as an early stage of the pathomechanism of atherosclerotic vascular diseases.[30] Endothelial dysfunction was reported to be related to cardiovascular risk factors such as diabetes mellitus, hypertension, dyslipidemia, aging and smoking and predicts future development and prognosis of coronary artery disease, stroke and peripheral arterial disease.[31,32] Endothelial dysfunction is also a major pathophysiology of ED. Endothelial-derived nitric oxide (NO) is necessary for endothelium-dependent vasodilation and plays an important role in the maintenance of an erection.[33] Oxidative stress impairs endothelium-dependent vasodilation by the interruption of NO pathway.[34] It was reported in several studies performed in the West that obesity was related to endothelial dysfunction and that weight reduction improved the endothelial function.[35–37] However, a study[38] performed in Japan reported that not only obesity but also a low BMI may be a risk factor for impaired endothelium-dependent vasodilation through increased oxidative stress, leading to the reduced bioavailability of NO. They showed that the forearm blood flow response to acetylcholine in the low BMI group was lower than the normal-weight group and similar to that of the obese group. Also, co-infusion of vitamin C, anti-oxidant augmented the forearm blood flow response to acetylcholine in both the low BMI group and the obese group. These findings suggest that oxidative stress may be, at least in part, involved in impaired endothelium-dependent, NO-mediated vasodilation in subjects with a low BMI as well as obese individuals. It is remarkable that all studies suggesting the possibility of a U-shaped relationship between BFM and ED or endothelial dysfunction were carried out in Asia.

We excluded men with several disease conditions, which may affect ED and/or BFM, in order to prohibit confounding bias, though there may be undetected diseases or medications. In addition, only two men among the study subjects were underweight (BMI <18.5 kg m^{-2}). This means that most men of the lowest BFM group were actually of normal-weight. Therefore, it was unlikely that the high prevalence of ED in the lowest BFM group was attributed to a pathologic condition or poor general health. ED was diagnosed through IIEF-5 in this study. Here, 29.8% of the subjects were not suitable for being respondents of IIEF-5 because they did not have sexual activity within the most recent 6 months. However, their general characteristics were

not different from men with IIEF-5 $\leqslant$ 17, and 85.5% of them reported that they had low confidence in their ability to get and keep an erection. Therefore, it appears more appropriate to include rather than exclude them; and indeed, excluding them did not appear to affect the study results significantly. In this study, depression was related to ED together with BFM. In the Massachusetts Male Aging Study,[39] men with depression had a nearly twofold higher risk of having ED compared with men without depression. ED can be a symptom of depression, and depression can occur secondary to ED.[40] Depression is a risk factor of obesity and is also an important cause of significant weight loss of the elderly; therefore, depression could function as a confounder between BFM and ED. However, a U-shaped relationship between BFM and ED was also maintained in analyses after excluding men diagnosed as having depression (Data not shown). The sample size of our study was not large enough to perform further analyses. In spite of these several limitations, this study has advantages in diagnosing ED by a standardized IIEF-5 questionnaire, using BF% as a marker of BFM, and including a sufficient number of men aged 65 years and older.

We demonstrated that BFM and ED had a U-shaped relationship in Korean men. These findings suggest that not only obesity but also a low BFM may be a risk factor of ED in Asians. The differences between the results of this study and previous Western studies need to be further elucidated.

Acknowledgments

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