MAYO CLINIC

Overweight Without Central Obesity, Cardiovascular Risk, and All-Cause Mortality

Xin He, MD; Chen Liu, MD, PhD; Yili Chen, MD, PhD; Jiangui He, MD, PhD; and Yugang Dong, MD, PhD

Abstract

Objective: To assess the association of overweight without central obesity with risks of mortality.

Patients and Methods: We included 14,299 participants in the Third National Health and Nutrition Examination Survey (from October 18, 1988, through October 15, 1994). According to their body mass index and waist circumference, participants were categorized into 7 anthropometric groups. Logistic regression models were used to assess the relation of cardiovascular risk factors (hypertension, diabetes, or hypercholesterolemia) and 10-year cardiovascular risk to anthropometric groups. Cox proportional hazards models were used to assess the risk of all-cause mortality, and competing-risks regression models were used for calculating cardiovascular and noncardiovascular mortality.

Results: Compared with those with normal body mass index and waist circumference, overweight men without central obesity were more likely to have all 3 cardiovascular risk factors and a high cardiovascular risk, whereas women in this anthropometric group were more likely to have hypercholesterolemia. In proportional hazards models, overweight without central obesity was associated with lower all-cause mortality among men in the population with cardiovascular risk factors (hazard ratio, 0.71; 95% CI, 0.56-0.89; *P*=.004) and the general population (hazard ratio, 0.72; 95% CI, 0.60-0.87; *P*=.001), whereas results of these comparisons among women were not significant (*P*>.05). In competing risk analyses, overweight men without central obesity had a lower risk of noncardiovascular mortality, but not cardiovascular mortality.

Conclusion: Although overweight without central obesity was associated with cardiovascular risk factors and a high cardiovascular risk among men, men in this anthropometric group had a lower mortality risk.

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O besity defined by body mass index (BMI; calculated as the weight in kilograms divided by the height in meters squared) is a risk factor for cardiovascular and all-cause mortality.[1-3] However, limitations of BMI, such as inaccuracy in adiposity evaluation, have been highlighted over the past 2 decades. In light of this, measures of central obesity are recommended as complements to BMI to evaluate the accumulation of abdominal fat.[4] It has been demonstrated that waist circumference (WC) and waist-hip ratio are associated with cardiovascular disease and premature death independent of BMI.[5,6] Recent studies reported that persons with normal BMI and elevated WC or waist-hip ratio were at the highest risk of death, demonstrating the importance of combining BMI and central obesity category.[7,8]

Although being overweight is associated with numerous risk factors, the risk of mortality among overweight persons remains controversial.[1,5,9,10] A recent meta-analysis even found that overweight persons were actually at a lower risk of all-cause mortality.[10] However, it remains poorly studied whether the combination of central obesity with overweight can improve the prediction of mortality.

Because overweight without central obesity might be associated with higher muscle mass,[11,12] which is a predictor of longevity,[13] we hypothesized that overweight persons without central obesity would have a survival advantage. We investigated the mortality risks of different anthropometric groups on the basis of a combination of BMI and WC in a large sample of the US population in the Third National Health and Nutrition Examination Survey (NHANES III).

From the Department of Cardiology, The First Affiliated Hospital of Sun Yat-sen University, Guangzhou, China, and Key Laboratory on Assisted Circulation, Ministry of Health, Guangzhou, China.

PATIENTS AND METHODS

Participants

NHANES III was a cross-sectional survey in a stratified, multistage, probability sample of the noninstitutionalized civilian resident population of the United States, which was conducted from October 18, 1988, through October 15, 1994. The survey consisted of personal interviews, standardized physical examinations, and laboratory tests. The WC was measured in the horizontal plane just above the uppermost lateral border of the ilium by a qualified examiner. Detailed descriptions of the plan and operation of the survey are available on the National Center for Health Statistics' website.[14] The study was approved by the National Center for Health Statistics Research Ethics Review Board, and a signed informed consent form was obtained from every participant. Our study included adult participants ($\geq$18 years) with available information on BMI, WC, mortality status, and important covariates (education level, smoking status, family income, and physical activity). Pregnant women, persons with a BMI lower than 18.5 kg/m^2, and patients with a history of malignancy were excluded from analyses. The final sample was 14,299 adults (6945 men and 7354 women), which represented the general population in our analyses. The 2013 American Heart Association/American College of Cardiology/The Obesity Society Guideline for Management of Overweight and Obesity in Adults recommends intentional weight loss in overweight persons with 1 or more cardiovascular risk factors but not in those without risk factors,[15] suggesting that the effect of overweight could be different in these 2 groups of individuals. Therefore, analyses were also performed in a subpopulation with cardiovascular risk factors in our study. The subpopulation consisted of participants with a history of hypertension, diabetes, or hypercholesterolemia. There were 9151 adults (4453 men and 4698 women) in the population with cardiovascular risk factors (Supplemental Figure, available online at http://www.mayoclinicproceedings.org).

Outcomes

Mortality status was obtained from the 2011 Public-Use Mortality Linked Files. Included participants were matched to the National Death Index through December 31, 2011, using a probabilistic matching algorithm. A detailed description of the methodology can be found elsewhere.[16] There was no loss to follow-up in the included data. Those who were alive on December 31, 2011, were censored at the end of follow-up. The *International Classification of Diseases, 10th Revision* codes were used to ascertain the leading cause of death. Cardiovascular deaths were defined as those with codes I00-I09, I11, I13, I20-I51, and I60-I69.

STATISTICAL ANALYSES

On the basis of a combination of BMI (normal-weight, 18.5-24.9 kg/m^2; overweight, 25-29.9 kg/m^2; mild obesity, 30-34.9 kg/m^2; severe obesity, $\geq$35 kg/m^2) and central obesity (WC>102 cm for men and >88 cm for women) category, persons were categorized into 7 anthropometric groups: Normal-weight/Normal WC, Overweight/Normal WC, Mild obesity/Normal WC, Normal-weight/High WC, Overweight/High WC, Mild obesity/High WC, and Severe obesity/High WC. Severe obesity was not further categorized according to WC because most severely obese individuals had WC higher than the cutoff points of central obesity—only 7 severely obese participants had normal WC. Education level was categorized into 3 groups: less than 12 years, 12 years, and more than 12 years. Smoking status was presented as nonsmoker, former smoker, and current smoker. Family income was categorized into 2 groups: less than $20,000 and greater than or equal to $20,000 per year. Physical activity was categorized into 3 groups: 0, less than 5, and 5 times or more per week of moderate- to vigorous-intensity activities. Differences in baseline characteristics between groups were examined by Pearson χ^2 tests for categorical variables and unpaired t tests for continuous variables. Trends of age across BMI categories were examined by linear regression, with normal-weight, overweight, mild obesity, and severe obesity coded as 0, 1, 2, and 3, respectively.

The primary analytic goal was to assess the mortality risks of Overweight/Normal WC as well as other anthropometric groups in the population with cardiovascular risk factors and the general population.

Multivariate logistic regression models were used to evaluate the associations of