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Original article

Prevalence of obesity, abdominal obesity and associated factors in hypertensive adults aged 45–75 years

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SUMMARY

Background & aims: We aimed to examine the prevalence of obesity, abdominal obesity and associated factors in 17,656 Chinese hypertensive adults aged 45–75 years.
Methods: A cross-sectional investigation was carried out in Lianyungang, China. Overweight or obesity was defined as a body mass index of ≥25 kg/m^2. Abdominal obesity was defined as a waist circumference ≥90 cm for men and ≥80 cm for women.
Results: The prevalence of overweight or obesity and abdominal obesity was 54.4% (women 59.3% and men 46.0%) and 59.4% (women 73.8% and men 35.1%), respectively. In the multivariable logistic-regression models, higher hypertension grades and standard of living, greater red meat consumption, lower physical activity levels, and antihypertensive treatment were independently associated with overweight or obesity and abdominal obesity in both sexes. Inland residence (versus coastal) was an independent associated factor for abdominal obesity in both sexes. Furthermore, a positive family history of diabetes in both sexes, a positive family history of hypertension, men with a positive family history of coronary heart disease, and men with inland residence were all independently associated with overweight or obesity.
Conclusions: We found a high prevalence of overweight or obesity and abdominal obesity in Chinese hypertensive adults, particularly in inland areas.

1. Introduction

Body mass index (BMI) and waist circumference (WC) are the widely used measures for the assessment of obesity and abdominal obesity, respectively. BMI has been linked with many health outcomes,[1–3] including mortality, coronary heart disease, and stroke. However, most studies have also shown an independent effect of abdominal obesity on cardiovascular disease (CVD) risk factors.[4–7] Therefore, it is assumed that the combination of BMI and WC would be more predictive.[4]

A significant amount of evidence from observational studies has proven that body weight and excess body fat are directly associated with blood pressure.[8,9] There also is conclusive evidence that weight reduction lowers blood pressure in obese patients, and has beneficial effects on associated risk factors such as insulin resistance, diabetes, and left ventricular hypertrophy.[9,10] It has been suggested that obese hypertensive patients should first practice weight and WC control, but should follow these with a stress-free, long-term weight-loss plan.[11] More importantly, considering the well-recognized difficulties of maintaining weight loss, efforts to

Abbreviations: BMI, body mass index; BP, blood pressure; CHD, coronary heart disease; CVD, cardiovascular disease; DBP, diastolic blood pressure; HTN, hypertension; SBP, systolic blood pressure; WC, waist circumference.

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prevent obesity among those with a normal body weight are also very important.

The prevalence of obesity or abdominal obesity varies significantly across the world.[12] Therefore, designing appropriate health plans and preventive measures requires gathering the necessary information on obesity or abdominal obesity from different geographical areas. However, to our knowledge, no previous publication has studied the prevalence of obesity and abdominal obesity in Chinese hypertensive adults, particularly in coastal areas. For this reason, the present study was designed to examine the prevalence rates of obesity, abdominal obesity and their associated factors in Chinese hypertensive adults aged 45–75 years in Lianyungang, Jiangsu province, China.

2. Subjects and methods

2.1. Study population

The study subjects were participants of an ongoing China Stroke Primary Prevention Trial (CSPPT). CSPPT is a multi-center, randomized controlled trial designed to confirm that enalapril maleate and folic acid tablets combined is more effective in preventing stroke among patients with hypertension when compared with enalapril maleate alone. Details regarding inclusion/exclusion criteria, treatment assignment, and outcome measures of the trial have been described elsewhere (http://clinicaltrials.gov/ct2/show/NCT00794885). In this study, we included subjects from Lianyungang who participated in the screening phase of the CSPPT.

Briefly, we conducted a community-based screening in 20 townships within two counties (Ganyu, which is coastal, and Donghai, which is inland) in Lianyungang of Jiangsu province, East China, from October 2008 to September 2009. The inclusion criteria were as follows: (1) aged 45–75 years; and (2) seated systolic blood pressure (SBP) ≥140 mmHg and/or seated diastolic blood pressure (DBP) ≥90 mmHg at both of two screening visits (with at least 24 h between visits) or currently under anti-hypertension treatment. Participants were excluded if they reported a history of myocardial infarction, stroke, heart failure, cancer, or serious mental disorders; or if they were unwilling to participate in the survey. This study was approved by the Ethics Committee of the Institute of Biomedicine, Anhui Medical University, Hefei, China. Written informed consent was obtained from each participant before data collection.

2.2. Data collection procedures

Baseline data collection was conducted by trained research staff according to a standard operating procedure. Each participant was interviewed using a standardized questionnaire designed specifically for this study. The question about standard of living was phrased as follows, “How does your standard of living compare to others?” and a choice of three responses: bad, medium, and good was provided. The question about physical activity was phrased as follows, “How do you describe your daily physical activity level?” and a choice of three responses: low, moderate, and high was provided. The question about meat consumption was phrased as follows, “Do you eat meat (red meat) frequently (count the yearly averaged weekly intake times of meat consumption)?” and a choice of four responses: <1 time, 1–2 times, 3–5 times, ≥5 times, was provided. The question about fruit and green vegetable consumption was phrased as follows, “How much fruit and green vegetables do you eat (count the yearly averaged weekly intake of fruits and green vegetables)?” and a choice of three responses: <1 jin (<500 g), 1–3 jin (500–1500 g), and ≥3 jin (≥1500 g), was provided. Finally, the question regarding family history was phrased as follows, “Has any of your immediate family (mother, father and or siblings) had any of the following conditions?”, and the choices of hypertension, diabetes, coronary heart disease (CHD) and stroke were given.

Anthropometric measurements, including height, weight and waist circumference, were taken using a standard operating procedure. Height was measured without shoes to the nearest 0.1 cm on a portable stadiometer. Weight was measured in light indoor clothing without shoes to the nearest 0.1 kg. BMI was calculated as weight (kilograms)/height (meters) squared. WC was measured as the minimum circumference between the inferior margin of the ribcage and the crest of the ileum.

Seated blood pressure (BP) measurements were obtained by trained research staff after subjects had been seated for 10 min using a mercury manometer with the standard method of calibration and appropriately sized cuffs, according to a standard operating procedure. Triplicate measurements on the same arm were taken, with at least 2 min between readings. Each patient’s systolic and diastolic blood pressures were calculated as the mean of the three independent measures. Blood pressure measured at visit 2 was used for analysis.

2.3. Statistical analysis

Hypertension (HTN) was categorized into three grades: grade 1, SBP 140–159 and/or DBP 90–99 mmHg; grade 2, SBP 160–179 mmHg and/or DBP 100–109 mmHg; grade 3, SBP ≥180 mmHg and/or DBP ≥110 mmHg. Treated hypertension was defined as receiving antihypertensive medication within the past 2 weeks. Current smoking was defined as having smoked at least 1 cigarette per day or ≥18 packs in the last year. Current drinking was defined as drinking alcohol at least 2 times per week in the last year. Overweight and obesity were defined according to the World Health Organization classifications[13] as a BMI of 25.0–29.9 kg/m^2 and a BMI of ≥30.0 kg/m^2, respectively. Abdominal obesity was defined according to the guidelines of the International Diabetes Federation for Chinese populations as a waist circumference ≥90 cm for men and ≥80 cm for women [14]. Additional BMI cut-off points (BMI ≥ 23, BMI ≥ 24, BMI ≥ 25, and BMI ≥ 30, respectively) and WC cut-off points (WC ≥ 80, WC ≥ 85, WC ≥ 88, WC ≥ 94, and WC ≥ 102, respectively) were also used.

Means and proportions were calculated for population characteristics by sex. The differences in population characteristics were compared using the Student’s t tests or chi-square test. The adjusted odds ratios (ORs) and 95% confidence interval (CI) of having overweight or obesity or having abdominal obesity were determined from multivariable logistic-regression models that included age group (45–54, 55–64, and 65–75 years), sex, cigarette smoking, alcohol drinking, antihypertensive treatment status (treated and untreated), HTN grades (controlled blood pressure or grade 1 HTN, grade 2 HTN, and grade 3 HTN), geographic region (coastal and inland), standard of living (bad, medium and good), meat consumption (<1 time/week, 1–2 time/week, ≥3 time/week), fruit and green vegetable consumption (<1 jin (<500 g)/week, 1–3 jin (500–1500 g) /week, and ≥3 jin (≥1500 g)/week), education level (illiterate, primary level, elementary or higher levels), physical activity level (low, moderate, and high) and family history of HTN, diabetes, CHD or stroke. Multivariable linear regression models were also applied to evaluate the relation between BMI or WC and the above factors. All of the statistical analyses were performed in SAS 8.2 (SAS Institute, Cary, NC, USA).

3. Results

Overall, 19,705 participants aged 45–75 years with hypertension were screened. In this report, study participants with CVD ($n = 604$), cancer ($n = 46$), diabetes ($n = 688$), dyslipidemia