Journal of Epidemiology xxx (2017) 1–5

Contents lists available at ScienceDirect

Journal of Epidemiology

journal homepage: http://www.journals.elsevier.com/journal-of-epidemiology/

Original Article

Prevalence of abdominal obesity among Chinese adults in 2011

Pei Du [a, b, d], Hui-Jun Wang [c, d], Bing Zhang [c], Su-Fen Qi [a], Ying-Jun Mi [a], Dian-Wu Liu [a], Qing-Bao Tian [a, *]

[a] Department of Epidemiology and Statistics, School of Public Health, Hebei Medical University, China
[b] Department of Infection Control and Prevention, The Third Hospital of Hebei Medical University, China
[c] National Institute for Nutrition and Food Safety, Chinese Center for Disease Control and Prevention, China

ARTICLE INFO

Article history:
Received 31 March 2016
Accepted 6 July 2016
Available online xxx

Keywords:
Abdominal obesity
WC
Prevalence
Chinese adults

ABSTRACT

Background: The prevalence of abdominal obesity is increasing dramatically worldwide. This study aimed to estimate the current prevalence of abdominal obesity from the 2011 China Health and Nutrition Survey (CHNS) and compare the data with other countries.
Methods: Waist circumference (WC) of 12,326 Chinese adults (aged 20 years or older) from the 2011 CHNS were analyzed by age group and region. Abdominal obesity was defined as a WC ≥90 cm for men and WC ≥80 cm for women based on World Health Organization (WHO) recommendations for Asians.
Results: In 2011, the age-adjusted mean WC was 85.9 cm (95% confidence interval [CI], 85.6–86.2 cm) for men and 80.7 cm (95% CI, 80.4–80.9 cm) for women. Based on the WHO recommendations, the age-adjusted prevalence of abdominal obesity was 44.0% (95% CI, 43.1%–44.8%) overall, 35.3% (95% CI, 34.1%–36.6%) in men, and 51.7% (95% CI, 50.5%–52.9%) in women. Moreover, the age-adjusted prevalence was 44.0% (95% CI, 42.7%–45.2%) in rural populations, 42.5% (95% CI, 40.7%–44.2%) in urban populations, and 45.2% (95% CI, 43.5%–46.9%) in megacity populations. The prevalence in China (35.3% for men and 51.7% for women) was lower than in Japan (50.8% for men) and the United States (43.5% for men and 64.7% for women). Similar results were observed when applying the criteria suggested by the Working Group on Obesity in China.
Conclusions: In 2011, the age-adjusted prevalence of abdominal obesity in China was 35.3% in men and 51.7% in women.

Introduction

Obesity is a major risk factor for hypertension, type 2 diabetes, coronary heart disease, and certain types of cancer.[1–6] Obesity is classified as general obesity (defined as body mass index ≥30 kg/m^2) and abdominal obesity (defined as waist circumference [WC] ≥90 cm for men and WC ≥80 cm for women), based on World Health Organization (WHO) recommendations for Asians.[7,8] In particular, abdominal obesity has a close relationship with central fat localization and cardiovascular disease, independently of general obesity.[9–11]

The prevalence of abdominal obesity is increasing dramatically worldwide.[12–14] In the United States, the overall age-adjusted prevalence of abdominal obesity increased significantly from 46.4% (95% confidence interval [CI], 42.1%–50.8%) in 1999–2000 to 54.2% (95% CI, 51.3%–57.0%) in 2011–2012.[12] Similarly, there has also been a large increase in the number of adults with abdominal obesity in China.[15,16] For example, in Shanghai, the prevalence of abdominal obesity increased from 17.3% (95% CI, 16.2%–18.4%) in 1998–2001 to 22.4% (95% CI, 21.2%–23.7%) in 2007–2008.[16] However, most previous studies primarily focused on specific cities. The China Health and Nutrition Survey (CHNS) was a recent large-scale longitudinal, household-based survey in China.[17] Data from the CHNS for 1993–2009 show that mean WC values increased from 76.5 cm to 83.5 cm among men and from 74.5 cm to 79.2 cm among women.[18] Additionally, the prevalence of abdominal obesity

* Corresponding author. Department of Epidemiology and Statistics, School of Public Health, Hebei Medical University, 361 East Zhongshan Road, Shijiazhuang, Hebei Province, China.
E-mail address: tqb1980@hebmu.edu.cn (Q.-B. Tian).
Peer review under responsibility of the Japan Epidemiological Association.
[d] The first two authors should be regarded as joint First Authors.

http://dx.doi.org/10.1016/j.je.2017.03.001

Please cite this article in press as: Du P, et al., Prevalence of abdominal obesity among Chinese adults in 2011, Journal of Epidemiology (2017), http://dx.doi.org/10.1016/j.je.2017.03.001

significantly increased in all sex and age groups.[18] In 2011, Gordon-Larsen et al[19] reported that the Chinese age-adjusted mean WC was 83.2 cm for men and 78.1 cm for women.

However, the detailed prevalence of abdominal obesity in different regions among Chinese adults remains unknown. Until now, data from the 2011 CHNS are the most recent data available. Therefore, we report the regional prevalence of abdominal obesity in 2011 and compare the recent WC distribution with data from 1993 to 2009. In addition, the prevalences of abdominal obesity among adults in China and other countries are also compared.

Methods

Study design

The CHNS was designed to measure the nutritional status and health of the Chinese population.[20] This program was a multipurpose, longitudinal, household-based survey that was established as a joint project of the University of North Carolina at Chapel Hill and the China Center for Disease Control and Prevention.[17] The CHNS data were first collected in 1989 and have since then been collected in 1991, 1993, 1997, 2000, 2004, 2006, 2009, and 2011 (http://www.cpc.unc.edu/projects/china). The original survey in 1989 used a multistage, random cluster design in eight provinces (Liaoning, Jiangsu, Shandong, Henan, Hubei, Hunan, Guangxi, and Guizhou). Heilongjiang province was added in 1997, and three megacities, including Beijing, Shanghai, and Chongqing, were added in 2011. By 2011, the provinces included in the CHNS sample constituted 47% of China's population (according to the 2010 census).[20] Zhang et al described the details of the surveys elsewhere.[20] Written informed consent was obtained. This study was approved by the ethical standards committee of the University of North Carolina at Chapel Hill (approval Number: 07-1963).

Study population

Since WC was initially collected in 1993, analysis was based on data from CHNSs conducted in 1993, 1997, 2000, 2004, 2006, 2009, and 2011. This study only focused on adults aged 20 years or older in each survey; the data provided information on age, gender, urban-rural status, and WC. To limit biases caused by pre-existing factors, this analysis excluded participants who were diagnosed with pregnancy or who were lactating. In addition, participants with missing information on WC or extreme or implausible WC (<45.0 cm or >150.0 cm) values were excluded.

Anthropometric methods and definitions of abdominal obesity

WC was measured at a point midway between the lowest rib and the iliac crest in a horizontal plane using non-elastic tape (Seca North America, Chino, CA, USA).[18] According to WHO recommendations, abdominal obesity was defined as a WC ≥90 cm for men and a WC ≥80 cm for women[8]; alternately, according to the Working Group on Obesity in China (WGOC) criteria, abdominal obesity was defined as a WC ≥85 cm for men and a WC ≥80 cm for women.[21]

Statistical analysis

Statistical analyses were performed using SPSS software version 19.0 (IBM 19.0, IBM Corp., Armonk, NY, USA). All of the participants included in our analysis were grouped by age: 20–39 years, 40–59 years, and ≥60 years. Taking into account different sample designs, prevalence of abdominal obesity was adjusted using the direct method for the China Census population in 2010. Comparisons of age-adjusted prevalence estimates of abdominal obesity between men and women in the 2011 CHNS were conducted using a χ^2 test. The statistical significance was determined as a two-tailed $p < 0.05$. Spearman rank correlation was applied to assess the trends in WC. To further track trends in WC, selected percentiles were graphed by gender and age group. Comparisons of the prevalence estimates were conducted between eight countries, including China (2011), the United States (2011–2012),[12] Japan (2009),[22] England (2008),[23] Spain (2008–2010),[24] Canada (2007–2009),[25] Korea (2011),[26] and Portugal (2008–2009).[27] All comparisons used the most recent data available.

Results

Pregnant or lactating ($n = 93$) women were excluded from data analysis. Additionally, participants with missing data ($n = 366$), or extreme WC values of <45.0 cm or >150.0 cm ($n = 23$) were also excluded. Ultimately, a total of 12,326 participants in 2011 were included in the analysis. The unweighted sample sizes of the 2011 CHNS for analyses are presented in Table 1.

To estimate the most recent prevalence of abdominal obesity and mean WC in different regions, we analyzed data in the 2011 CHNS. Based on the WHO recommendations for Asians, age-adjusted abdominal obesity prevalence was 44.0% (95% CI, 43.1%–44.8%) overall; age-adjusted abdominal obesity prevalence was 35.3% (95% CI, 34.1%–36.6%) for men and 51.7% (95% CI, 50.5%–52.9%) for women (both $p < 0.001$) (Table 2). The prevalence among women was higher than that among men (odds ratio [OR] 1.96; 95% CI, 1.83–2.11). Compared with the prevalence among 20- to 39-year-olds, the ORs for 40–59-year-olds and those aged ≥60 years were 1.99 (95% CI, 1.81–2.19) and 2.19 (95% CI, 1.98–2.42), respectively. Prevalence among men was 33.3% (95% CI, 31.6%–35.1%) in rural populations, 34.5% (95% CI, 32.0%–36.9%) in urban populations, and 39.4% (95% CI, 36.9%–41.8%) in megacity populations ($p < 0.001$). Prevalence among women was 53.4% (95% CI, 51.7%–55.1%) in rural populations, 49.8% (95% CI, 47.4%–52.2%) in urban populations, and 51.0% (95% CI, 48.6%–53.3%) in megacity populations ($p = 0.043$). Of note, the prevalence for men was higher in megacity populations than in rural populations ($p < 0.001$); in contrast, the prevalence for women was lower in urban populations than in rural populations ($p = 0.018$). Similar results were observed when using the WGOC criteria (eTable 1).

The age-adjusted mean WC was 83.1 cm (95% CI, 82.9–83.3 cm) overall; 85.9 cm (95% CI, 85.6–86.2 cm) for men and 80.7 cm (95% CI, 80.4–80.9 cm) for women (all $p < 0.001$) (eTable 2). Among men, mean WC was 85.0 cm (95% CI, 84.6–85.4 cm) in rural populations,

Table 1
Unweighted sample sizes (and weighted percentages of total) for adults aged 20 years and older: CHNS 2011.

	Unweighted number (weighted %)			
	Total	Rural	Urban[a]	Megacity
All	12,326 (100)	5965 (100)	3050 (100)	3311 (100)
Men				
≥20 years	5786 (46.9)	2790 (46.8)	1443 (47.3)	1553 (46.9)
20–39 years	1288 (10.4)	572 (9.6)	311 (10.2)	405 (12.2)
40–59 years	2751 (22.3)	1366 (22.9)	650 (21.3)	735 (22.2)
≥60 years	1747 (14.2)	852 (14.3)	482 (15.8)	413 (12.5)
Women				
≥20 years	6540 (53.1)	3175 (53.2)	1607 (52.7)	1758 (53.1)
20–39 years	1540 (12.5)	674 (11.3)	327 (10.7)	539 (16.3)
40–59 years	3077 (25.0)	1538 (25.8)	729 (23.9)	810 (24.5)
≥60 years	1923 (15.6)	963 (16.1)	551 (18.1)	409 (12.3)

CHNS, China Health and Nutrition Survey.
[a] Does not include the three megacities added in 2011.

Please cite this article in press as: Du P, et al., Prevalence of abdominal obesity among Chinese adults in 2011, Journal of Epidemiology (2017), http://dx.doi.org/10.1016/j.je.2017.03.001