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Original article

Assessing the relationship between a body shape index and mortality in a group of middle-aged men☆

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SUMMARY

Background & aims: Recently, a new anthropometric parameter emerged, namely A Body Shape Index (ABSI), which appears to be a major risk factor for mortality in the American and British populations. To the best of our knowledge, the relationship between ABSI and mortality was not studied previously in the middle-aged Chinese men. Therefore, we assessed the relationship based on a 15-year prospective study.

Methods: In an urban community of Chengdu, 780 middle-aged Chinese men were included in 1992 and followed up for 15 years.

Results: During the follow-up, 29 subjects died (mortality rate: 3.7%), and ABSI tended to be linearly associated with mortality. The subjects could be categorized into five groups by the quintiles of baseline ABSI, as follows: the first quintile (Q1), the second quintile (Q2), the third quintile (Q3), the fourth quintile (Q4) and the fifth quintile (Q5). Across the quintiles, the mortality rates were 3.8%, 5.3%, 3.0%, 4.7% and 1.9% in Q1, Q2, Q3, Q4 and Q5, respectively ($p_{trend} = 0.386$). With the highest quintile (Q5) as reference, univariate and multivariate Cox regression analyses presented that ABSI was not associated with mortality.

Conclusions: ABSI, a new anthropometric parameter, might not be associated with mortality in the middle-aged Chinese men. Further studies are needed to explore the specificities of ABSI in different populations.

1. Introduction

Obesity is increasing around the world, and can cause many health problems, such as hypertension, type 2 diabetes, dyslipidaemia, stroke, coronary heart disease and certain forms of cancer [1,2]. In clinical practices, body mass index (BMI) is important for managing public health associated with obesity, which has been recommended by several guidelines [3,4]. Although BMI is widely used, it does not accurately assess fat content, reflect the proportions of muscle and fat, or interpret sex and racial differences in fat content and distribution [5–7]. Recently, waist circumference (WC) has emerged as an important complement to BMI for indicating the risk of obesity [3,4]. However, the close correlation between WC and BMI should not be neglected. Based on these limitations, Krakauer NY et al. [7] developed a new anthropometric parameter (A Body Shape Index, ABSI), which has little correlation with height, weight, and BMI and a modest correlation with WC. For a given height and weight, high ABSI indicates that WC is higher than expected and corresponds to a more central concentration of body volume. The studies by Krakauer NY et al. have shown that ABSI is a major risk factor for mortality in the American and British populations [7,8].

Since ABSI was developed, it has been investigated in different populations [9–17]. However, to the best of our knowledge, the specific relationships between ABSI and mortality were not studied previously in other general populations [9–17], except for the two studies [7,8]. It is well known that there are racial and ethnic differences regarding the effects of anthropometric measures on health problems. Therefore, we assessed the relationship between

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ABSI and mortality based on a 15-year prospective study in a group of middle-aged Chinese men.

2. Subjects and methods

2.1. Subjects and study design

In 1992, health examinations were performed on 1450 individuals in an urban community of Chengdu, Sichuan province, China, and this was supported by a project from the National Eighth Five-Year Research Plan, China (Chinese Multi-Provincial Cohort Study). The 1450 subjects accepted standardized questionnaires, physical examinations and laboratory tests. Height was measured by a digital stadiometer with a fixed vertical backboard and an adjustable head piece. Weight was measured on a digital scale. At the end of a normal exhalation, WC was measured to the midpoint between the lower border of the rib cage and the iliac crest. In 2007, 711 of them accepted health examinations with the same methods, which were supported by megaprojects of science research for China's 11th 5-year plan (Trends in the incidence of metabolic syndrome and integrated control in China). Among the remaining 739 subjects, the outcomes (e.g. decease) were determined by telephone follow-up (n = 518), and 221 subjects were out of touch. This study was approved by the Ethics Committee of Fuwai Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, as well as by the Ethics Committee of West China Hospital of Sichuan University. All subjects gave informed written consent.

At the end of follow-up, the vital status of 780 men and 449 women could be determined by health examination or telephone follow-up. Follow-up rates were 83.2% for men and 87.7% for women, respectively. During the follow-up, 29 men and 4 women died. We excluded women from the analyses because of the few number of deaths (n = 4). Thus, 780 men were included for the present analysis (Fig. 1).

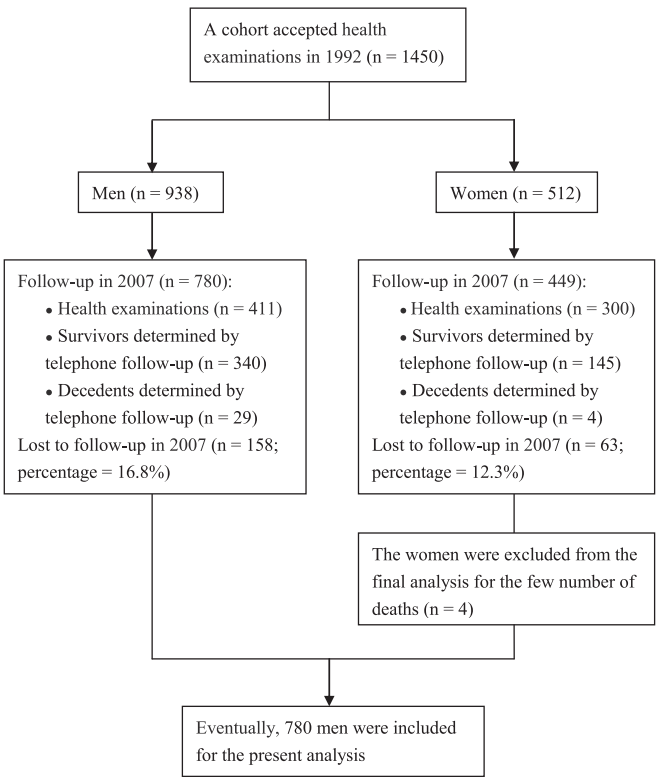

Fig. 1. Study flow diagram.

2.2. Related definitions

ABSI was defined as WC/($BMI^{2/3}$height$^{1/2}$), expressing WC and height in m. Those with hypertension were defined as having systolic blood pressure (SBP) $\geq$ 140 mm Hg and/or diastolic blood pressure (DBP) $\geq$ 90 mm Hg and/or currently taking antihypertensive medications. Diabetes mellitus (DM) was defined by a fasting plasma glucose $\geq$ 7.0 mmol/L or self-reported history. Cardiovascular diseases (CVD), including stroke and coronary heart disease, were defined by self-reported history. Smoking status was categorized as "never", "former" and "current" on the basis of self-report.

2.3. Statistical analysis

Descriptive statistics (mean ± SD, percentages, etc.) were used to summarize baseline characteristics. Independent t test and Mann–Whitney U test were used where appropriate to compare continuous variables, and categorical variables were compared by chi-square test. Correlations between different variables were determined using Pearson correlation analysis. A cubic spline smoothing technique was used to study the shape of the relationship of ABSI with the logarithm of the relative risk of mortality. To quantify in a simple form the relationship between continuous variables and mortality, we also carried out analyses where risk was computed separately for each quintile of continuous variables, relative to the quintile of lowest mortality. Survival curves were estimated according to the Kaplan–Meier method and compared by the log-rank test. To assess the role of ABSI as an independent predictor of mortality, Cox regression analysis was used. All analyses were performed with SPSS (version 17.0; Chicago, IL) and

Table 1
Baseline characteristics.

Variable	Data
Age (years)	49.0 ± 5.8
Height (m)	1.65 ± 0.06
Weight (kg)	63.2 ± 8.6
ABSI ($m^{11/6}$ $kg^{-2/3}$)	0.0748 ± 0.0043
BMI (kg/m^2)	23.2 ± 2.8
WC (m)	0.78 ± 0.08
SBP (mmHg)	115.3 ± 15.6
DBP (mmHg)	74.2 ± 9.3
FPG (mmol/L)	4.5 ± 2.2
Lipids (mmol/L)	
LDL-C	2.2 ± 0.8
HDL-C	1.2 ± 0.2
TG	2.2 ± 1.0
DM (%)	4.5
Hypertension (%)	17.7
CVD (%)	1.5
Smoking status (%)	
Never	31.2
Former	6.7
Current	62.2

Data are presented as mean ± SD, or percentage of subjects.
ABSI = a body shape index; BMI = body mass index; WC = waist circumference; SBP = systolic blood pressure; DBP = diastolic blood pressure; FPG = fasting plasma glucose; LDL-C = low-density lipoprotein cholesterol; HDL-C = high-density lipoprotein cholesterol; TG = triglyceride; DM = diabetes mellitus; CVD = cardiovascular disease.

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