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Prevalence of metabolic syndrome in elderly Japanese-Brazilians

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Background:

Prevalence of individuals with a high cardiovascular risk is elevated in elderly populations. Although metabolic syndrome (MS) increases cardiovascular risk, information is scarce on the prevalence of MS in the elderly. In this study we assessed MS prevalence in a population of elderly Japanese-Brazilians using different MS definitions according to waist circumference cutoff values.

Material/Methods:

We studied 339 elderly subjects, 44.8% males, aged between 60 to 88 years (70.1±6.8). MS was defined according to criteria proposed by the Joint Interim Statement in 2009. As waist circumference cut-off point values remain controversial for Asian and Japanese populations, we employed 3 different cutoffs that are commonly used in Japanese epidemiological studies: 1) >90 cm for men and >80 cm for women; 2) >85 cm for men and >90 cm for women; 3) >85 cm for men and >80 cm for women.

Results:

MS prevalence ranged from 59.9% to 65.8% according to the different definitions. We observed 90% concordance and no statistical difference ($p>0.05$) in MS prevalence between the 3 definitions. MS diagnosis according to all 3 cutoff values was found in 55.8% of our population, while in only 34.2% was MS discarded by all cutoffs. The prevalence of altered MS components was as follows: arterial blood pressure 82%, fasting glycemia 65.8%, triglyceride 43.4%, and HDL-C levels 36.9%.

Conclusions:

Elderly Japanese-Brazilians present high metabolic syndrome prevalence independent of waist circumference cutoff values. Concordance between the 3 definitions is high, suggesting that all 3 cutoff values yield similar metabolic syndrome prevalence values in this population.

key words:

metabolic syndrome • waist circumference • obesity • visceral fat

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BACKGROUND

Life expectancy has continuously increased in recent decades with the elderly part of the population growing. The prevalence of high cardiovascular risk is elevated in elderly populations [1]. Although metabolic syndrome (MS) or its isolated components increases cardiovascular risk, there is little information on MS prevalence in the elderly [1–7].

Metabolic syndrome is characterized by a combination of several metabolic and physiological abnormalities and is associated with a high risk for developing type 2 diabetes and cardiovascular disease and subsequent increased morbidity and mortality [1,8,9]. MS is considered to be strongly influenced by lifestyle. This is exemplified by the fact that individuals of Japanese ancestry living outside Japan have a higher prevalence of MS than Japanese living in Japan [4,10].

Despite this lower prevalence, Japanese living in Japan have a greater tendency to deposit adipose tissue as visceral fat [11]. Consequently, even when they present body mass indexes (BMI) and/or abdominal circumferences considered adequate in Caucasian populations, Japanese individuals are more prone to develop obesity-related morbidity and mortality [12–16]. Furthermore, Japanese have lower insulin-secreting capacity, and develop diabetes with lower insulin resistance compared to Westerners [17,18]. Therefore, lower waist circumference cutoff values than those used for the general population have been proposed as definition criteria for MS in Japanese and other Asians [9,19,20].

Various diagnostic criteria have been proposed for MS definition over the past decade. In 2009, the International Diabetes Federation (IDF) Task Force on Epidemiology and Prevention; the National Heart, Lung, and Blood Institute (NHLBI); the American Heart Association (AHA); the World Heart Federation; the International Atherosclerosis Society; and the International Association for the Study of Obesity all participated in an attempt to unify the definition of MS [20]. A Joint Interim statement was published, with societies agreeing that a single set of cutoff points would be used for all MS components except waist circumference [20], which remains controversial, especially for Asian populations and Japanese individuals.

Brazil has a large Japanese population. Considering the Japanese genetic predisposition for visceral fat deposition, one could anticipate a high MS prevalence in elderly Japanese-Brazilians who have incorporated the dietary habits of a Western nation [21]. In fact, previous studies have shown that MS prevalence in Japanese-Brazilians of all ages was higher than Japanese living in Japan or native Brazilians [4,22–25]. We now present data on MS prevalence in a population of elderly Japanese-Brazilians according to the Joint Interim statement definition [20], using 3 different waist circumference cutoff values.

MATERIAL AND METHODS

Subjects

This was a population based cross-sectional study of Japanese-Brazilians residing in the city of Bauru, Sao Paulo State, Brazil. A total of 339 elderly individuals were included,

comprising 152 men (44.8%) and 187 women (55.2%), aged between 60 to 88 years (70.1 ± 6.8). Participants were invited by mail and announcements on television and in the press. The protocol was approved by the Research Ethics Committee of Sao Paulo Federal University Clinical Hospital, and all subjects provided written informed consent on their initial visit to the Health Education Clinic of Bauru Sacred Heart University.

Data collection

All data were collected between November 2005 and February 2006. Participants were interviewed using standardized questionnaires and subjected to a clinical examination. BMI was calculated as weight (kilograms) divided by height (meters) squared. Waist circumference was measured at the mid-point between the lateral iliac crest and lowest rib. Arterial blood pressure was measured 3 times after a 10-min rest in the sitting position by an Omron automatic device (HEM-712C, Omron Health Care Inc., Vernon Hills, IL, USA). Venous blood was obtained after an overnight fast of at least 10 h. Glycemia and lipid fractions were measured using a kit automation system and apparatus from Boehringer-Mannheim® (Germany). Results of BMI classification are presented and discussed based on International Diabetes Institute (IDI) criteria for the Asian population [26]. According to the IDI, subjects with BMI's between 25.0 and 29.9 kg/m² and BMI >30.0 kg/m² are classified as I and II degree obesity, respectively.

Definition of metabolic syndrome

Subjects were considered to have MS when 3 or more of the following criteria were met: fasting glycemia >100 mg/dL or under drug treatment (DT) for diabetes mellitus; systolic arterial blood pressure (SAP) >130 mmHg and/or diastolic arterial blood pressure (DAP) >85 mmHg or under DT for arterial hypertension; triglycerides >150 mg/dL or receiving DT for dyslipidemia; HDL-cholesterol <40 mg/dL in men and <50 mg/dL in women or under DT for dyslipidemia; and elevated waist circumference [20]. Increased waist circumference was defined according to 3 different cutoff point: 1) >90 cm for men and >80 cm for women, proposed by the AHA/NHLBI/IDF for Asians [9,19,20]; 2) >85 cm for men and >90 cm for women, proposed by the Japanese Obesity Society for Japanese individuals [20,27]; and 3) >85 cm for men and >80 cm for women, commonly used in Asian and Japanese epidemiological studies [28,29].

Statistical analysis

Values are shown as means and standard deviations. MS prevalence is presented in descriptive form. The non-paired Student's T test was used for comparisons of age and anthropometric and laboratory parameters between sexes. Comparisons between the prevalence of MS, obesity, and altered MS components according to different cutoff values for waist circumference were analyzed by the Goodman's test for contrasts between and within multinomial populations [30]. All data were evaluated at a *p* level of 5%.

RESULTS

General characteristics of the study population are shown in Table 1. There was no difference between the ages of men

Table 1. General characteristics of the study population.

	Male	Female	P
Number (%)	152 (44.8)	187 (55.2)	
Age (years)	70.9±7.37	69.3±6.15	0.06
Weight (Kg)	64.5±9.82	54.4±8.73	<0.001
Height (m)	1.63±0.06	1.50±0.06	<0.001
BMI (kg/m ²)	24.4±3.36	24.2±3.74	0.70
WC (cm)	90.7±9.34	86.5±9.64	<0.001
Systolic BP (mmHg)	147.1±21.1	143.6±23.5	0.16
Diastolic BP (mmHg)	81.8±12.1	78.8±11.7	0.02
FBG (mg/dL)	115±23	108±25	0.006
TG (mg/dL)	156±119	151±86	0.64
HDL cholesterol (mg/dL)	50.4±12.7	55.8±12.9	<0.001

Data are expressed as means ±SD; BMI – body mass index; WC – waist circumference; BP – blood pressure; FBG – fasting blood glucose; TG – triglyceride; non-paired Student's t test for male vs. female.

and women (70.9±7.37 and 69.3±6.15 years, respectively). Mean values for body weight, height, waist circumference, diastolic blood pressure, and fasting blood glucose levels were statistically higher in men, and HDL-cholesterol levels were significantly lower in men than in women. There was no difference in BMI, systolic blood pressure, and triglyceride serum concentration between men and women.

MS prevalence in the 339 Japanese-Brazilians surveyed ranged from 59.9% to 65.8% according to the 3 waist circumference cutoff values (Table 2). There were no statistical differences in MS prevalence between the 3 definitions (p>0.05). MS diagnosis according to all 3 cutoff values was found in 55.8% of our population, while in only 34.2% was

MS discarded by all cutoff values. We observed a 90% concordance between the 3 definitions.

In our population, 139 individuals (41%) were obese, presenting BMI >25.0 kg/m². Subjects with MS according to all 3 waist circumference (WC) cutoffs had a higher (60.3%) prevalence of obesity. The prevalence of obesity in individuals with and without MS according to the different definitions is shown in Table 2. Only 15.5% of individuals without MS by all 3 waist circumference cutoff values were found to be obese.

The prevalence of altered MS components was as follows: arterial blood pressure 82%, glycemia 65.8%, HDL-C 36.9%, and triglyceride levels 43.4%. The prevalence of altered WC was: 66.1% as per the Asians criteria (WC >90 cm for men and >80 cm for women), 54.0% as per the Japanese Obesity Society (WC >85 cm for men and >90 cm for women), and 76.4% as per Japanese epidemiological studies (WC >85 cm for men and >80 cm for women). The prevalence of altered MS components according to the different WC cutoff values is shown in Table 2. There was no significant difference in altered MS components prevalence between the different MS definitions.

DISCUSSION

In this study we showed that elderly Japanese-Brazilians living in a Brazilian city present a high prevalence of metabolic syndrome independent of the different waist circumference cutoff values used to establish MS.

We employed the MS definition proposed by the Joint Interim statement in 2009, using a single set of cutoff points for all MS components except waist circumference, which remains controversial for Asian and Japanese individuals [20]. We therefore evaluated MS prevalence using 3 different waist circumference cutoff values. We observed that MS prevalence was not statistically different between the 3 definitions. Furthermore, we found a high concordance (90%) between the 3 definitions.

Table 2. Prevalence of metabolic syndrome (MS), obesity (BMI ≥25.0 kg/m²), and altered MS components according to the different definitions of MS.

	WC ≥90cm for men and ≥80 cm for women ¹		WC ≥85 cm for men and ≥90 cm for women ²		WC ≥85 cm for men and ≥80 cm for women ³	
	MS-	MS+	MS-	MS+	MS-	MS+
Subjects (n, %)	130 (38.3)	209 (61.7)	136 (40.1)	203 (59.9)	116 (34.2)	223 (65.8)
Obesity	20 (15.4)	119 (56.9)*	23 (16.9)	116 (57.1)*	18 (15.5)	121 (54.3)*
Altered BP or DT	81 (62.3)	197 (94.3)*	86 (63.2)	192 (94.6)*	67 (57.8)	211 (94.6)*
Altered FBG or DT	53 (40.8)	170 (81.3)*	53 (39.0)	170 (83.7)*	42 (36.2)	181 (81.2)*
Reduced HDL-C or DT	9 (6.9)	116 (55.5)*	15 (11.0)	110 (54.2)*	8 (6.90)	117 (52.5)*
Altered TG or DT	10 (7.7)	137 (65.6)*	11 (8.09)	136 (67.0)*	8 (6.90)	139 (62.3)*

n – number of subjects; WC – waist circumference; MS- – absence of MS; MS+ – presence of MS; DT – drug treatment; altered BP – systolic blood pressure ≥130 mmHg or diastolic blood pressure ≥85 mmHg; altered FBG – fasting blood glucose ≥100 mg/dL; reduced HDL-C – men <40 mg/dL and women <50 mg/dL; altered TG – triglycerides ≥150 mg/dL. * p<0.01 vs. MS-, Goodman test. ¹ cutoff values as proposed by the AHA/NHLBI/IDF for Asians; ² cutoff values as proposed by the Japanese Obesity Society; ³ cutoff values commonly used in Japanese epidemiological studies.



MS prevalence in the elderly has been poorly characterized, as most epidemiological studies have included individuals from different age groups [4,31–34]. Furthermore, different MS definitions and exclusion criteria make it difficult to compare our results with those from the literature. As some studies were designed to prospectively evaluate MS and cardiovascular disease, individuals with diabetes or cardiovascular diseases were excluded from samples [33,35,36]. In elderly Americans free of cardiovascular disease at baseline, Scuteri et al. [35] found an MS prevalence of 35.1% according to NCEP ATPIII criteria. Even lower MS prevalences were found in non-diabetic elderly populations from France (12.1%) [36], and Japan (8.3% for men and 15.5% for women) [33]. Obviously, MS prevalence was higher in population studies including elderly individuals with diabetes and cardiovascular disease. In a Chinese cross-sectional study, the prevalence of MS in people over age 60 ranged between 30.5% and 46.3%, depending on the MS-defining criteria [2]. In Spain, MS frequency was 39.9% in elderly individuals [3]. Considering the AHA/NHLBI criteria for Westerners and the 70 to 89 age group, Yoneda et al [4] found MS prevalence in native Japanese of 10.3% in men and 28.0% in women, and in Japanese-Americans a prevalence of 39.2% in males and 36.3% in females.

Although comparison of our results with other elderly populations is problematic, our study showed a high prevalence of MS in elderly Japanese-Brazilians. Comparing MS prevalence between Japanese-Brazilians and native Brazilian populations is also difficult because of the small number of studies using different criteria for defining MS, and lacking specific data for elderly people [24,25]. Considering the general Brazilian population, MS prevalence ranged between 17.9% and 25.4%, depending on defining criteria [24,25], while in 30- to 88-year-old Japanese-Brazilians MS prevalence ranged between 46.5% and 56.5% according to criteria used to establish MS diagnosis [22].

Although not addressed in this study, the increased prevalence of MS observed in Japanese individuals living outside Japan suggests the importance of lifestyle and its influence on MS development. Brazilian diet usually contains a large proportion of sugar and fats, and insufficient fruits, vegetables, and greens, especially in residents of the more developed regions of Brazil – the south, southeast and central west [37]. However, the Japanese-Brazilian diet is also characterized by a high proportion of fruit and juices, with increased calorie levels [21,38]. The influence of diet Westernization on MS development was well illustrated by Schwingel et al. [10]. They evaluated Brazilian individuals of Japanese ancestry residing in Brazil and in Japan, and found a higher prevalence of MS for those living in Brazil (37.5%) *vs.* Japan (25.3%) [10].

A significant proportion of our elderly population (41%) presented a BMI index greater than 25.0 kg/m², which is considered obese. In addition to BMI, visceral abdominal adipose tissue increases the risk for comorbidities and cardiovascular mortality, and has been closely linked to other cardiovascular risk factors such as arterial hypertension and type 2 diabetes [39]. Because of the different waist circumference cutoff values, it is difficult to compare results from different studies in Asian populations. In this study, we found a high prevalence of increased waist circumference, ranging from 54.0% to 76.4%, according to the different

MS definitions. In Japanese men aged 52.3±9.0 years and women aged 53.5±9.0 years, mean waist circumference was 83.5±7.8 cm and 74.3±7.6 cm, respectively [28], much lower than in our study. Despite controversy surrounding the mechanisms involved in MS pathophysiology, visceral obesity is being increasingly recognized as an important etiological factor. In non-obese Japanese men, visceral fat was closely associated with insulin resistance and dyslipidemia [40]. This is an important issue when considering cardiovascular risk factors in our population, since it has a greater tendency toward visceral fat accumulation.

The role of MS as a risk factor for cardiovascular disease and mortality in elderly individuals has not been completely clarified. Recent studies have suggested that MS can predict cardiovascular disease in the elderly [1,2,16,35]. He et al. [2] and Butler et al. [1] found a higher risk of developing cardiovascular disease in older subjects with MS than in those without MS. Wang et al. [41] recently observed that MS predicted congestive heart failure independent of interim myocardial infarction in elderly Finns [41]. Also, MS correlated with cardiovascular disease in elderly diabetics [16].

CONCLUSIONS

In summary, this study shows that elderly Japanese-Brazilians living in a city in Sao Paulo State, Brazil, present a high prevalence of metabolic syndrome, independent of waist circumference cutoff values. The concordance between the 3 definitions used to diagnose metabolic syndrome was high. Our data suggest that, in this population, all 3 proposed waist circumference cutoff values give similar metabolic syndrome prevalence values.

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APPENDIX

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