International Journal of Gerontology 8 (2014) 127–132

Contents lists available at ScienceDirect

International Journal of Gerontology

journal homepage: www.ijge-online.com

Original Article

Prevalence of Metabolic Syndrome and Risk Factor Analysis Among Urban Elderly in One Medical Center in Northern Taiwan☆

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ARTICLE INFO

Article history:
Received 2 August 2012
Received in revised form
25 January 2013
Accepted 9 October 2013
Available online 29 August 2014

Keywords:
elderly,
metabolic syndrome,
Taiwan,
urban

SUMMARY

Background: Metabolic syndrome (MetS) is a major risk factor for the development of type 2 diabetes and cardiovascular diseases in the elderly. This study aimed to discuss the prevalence and risk factors of MetS in both the urban and rural elderly population of Taiwan.

Methods: A cross-sectional survey was conducted among elderly people (age ≥ 65 years) who received a senior-citizen health examination from March 2009 to November 2009. A total of 1181 participants (433 men, 36.7%; 748 women, 63.3%) were surveyed. MetS was defined using the modified Adult Treatment Panel III (ATP III) criteria.

Results: Of the study participants, 34.3% (405 of 1181 participants) had MetS. The percentage of those with two risk factors reached 30.1% (male: 31.2%; female: 29.5%), which was more common than having any other number of risk factors. Abnormalities in blood pressure, blood sugar, and waist circumference (WC) were the three most common risk factors. The odds ratio (OR) for MetS was higher with female sex, older age, and high body mass index (BMI) and lower with a higher education level. Strong correlations were found between BMI and WC, triglyceride (TG) and high-density lipoprotein cholesterol (HDL-C), and WC and HDL-C.

Conclusion: The majority of the elderly population in Taiwan had at least two risk factors for MetS. Patient education and regular screening are needed for early detection and management of risk factors in order to prevent evolvement to MetS and related chronic diseases.

1. Introduction

Metabolic syndrome (MetS) is closely associated with many chronic diseases and increases the risk of cardiovascular disease and type 2 diabetes[1–4]. At present, MetS is an important target of modern preventive medicine in an attempt to prevent occurrences of chronic diseases and reduce medical expenditures, as well as family and societal burdens. This is particularly important due to the gradual aging of the population. The Nutrition and Health Survey in Taiwan (NAHSIT-II; 1999–2000), a national survey of noninstitutionalized elderly (age ≥ 65 years) Taiwanese, showed that 39.3% of the elderly met the criteria for MetS[5,6]. One study surveyed the rural population of Taiwan's Nantou County (aged 51–80 years) in 2007 and found the prevalence of MetS to be 29%[7].

Due to variations in the diagnostic criteria, the prevalence of MetS in Taiwan may be underestimated or overestimated. Most studies used the diagnostic criteria issued by the National Health Bureau of Taiwan Health Department, which was comprised of five components: abdominal obesity (AO), hypertriglyceridemia (HTG), low serum high-density lipoprotein cholesterol (low HDL-C), hypertension (HT), and hyperglycemia (HG)[8].

This study differed from previous studies in that it was done on the elderly living in the urban area (those > 65 years of age living in Taipei City, Taiwan), and the questionnaires were completed via one-on-one interviews. We compared our data with the national data from the 1999–2000 NAHSIT-II[5,6] and the data of the rural population living in Nantou County, Taiwan[7], in the prevalence of MetS, the prevalence of the individual components, and the difference of MetS between different age groups. Few researches had been done previously to perform such a comparison. This study aims to grasp a better understanding of the difference in MetS components

☆ Conflicts of interest: The authors have no conflicts of interest to declare.

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http://dx.doi.org/10.1016/j.ijge.2013.10.006

between the urban and rural populations in Taiwan, thus allowing for development of effective preventive strategies for MetS for the entire elderly population in Taiwan.

2. Methods

2.1. Study participants

This study targeted elderly individuals (aged ≥ 65 years) who received a health examination from March 2009 to November 2009 at medical centers in Taipei City, Taiwan. Questionnaires were completed via one-on-one interviews. A total of 1799 elderly individuals received the health examination. A total of 420 cases were excluded due to incomplete questionnaires as a result of specific disabilities (e.g., dementia, difficulty in expression, severe hearing impairment) and another 198 cases were eliminated due to incomplete data on the five components of MetS. In the end, a total of 1181 complete questionnaires (recovery rate of 85.6%) were used.

2.2. Ascertainment of body mass index and health-risk behaviors

The height and weight of each participant were measured during the physical examination. Body mass index (BMI) is currently recognized as the standard measure of obesity and is calculated as weight in kg divided by the square of the height in meters (kg/m^2). A BMI <18.5 kg/m^2 is defined as underweight, a BMI between 18.5 kg/m^2 and 24 kg/m^2 is defined as normal, a BMI between 24 kg/m^2 and 27 kg/m^2 is defined as overweight, and a BMI ≥27 kg/m^2 is defined as obese[9,10].

Three types of health-affecting behaviors were assessed during the interview. Questions regarding alcohol consumption (considered yes if daily use), smoking tobacco (considered yes if daily use), and regular exercise (considered yes if ≥3 times/week) in the previous 6 months were asked.

2.3. Assessment of sociodemographic variables

Sociodemographic variables, including sex, education level, and living conditions, were assessed in the survey. Education level was classified as one of the following five levels: illiterate, elementary school, junior high school, senior high school, and college or higher. Living condition was defined as living alone or living with family.

2.4. Data collection

During the physical exam, sitting blood pressure (BP) and anthropometric measurements were performed. After the participant had rested for 5–10 minutes, two BP readings in the right arm were taken 30 seconds apart. If the first two BP readings differed by >10 mmHg, a third BP measurement was made. The average of the two higher readings was calculated and used in the analysis[11]. Waist circumference (WC) was measured with a tape measure placed around the participant's abdomen parallel to the floor at the end of a relaxed expiration[12]. Sodium Fluoride (NaF) plasma was

Table 1
Characteristics of the study participants by sex.

Variable	Total (n = 1181)	Male (n = 433, 36.7%)	Female (n = 748, 63.3%)	p
Age (mean ± SD)	74.4 ± 5.5	75.4 ± 5.3	73.8 ± 5.6	<0.001[a,**]
Age group (y)				<0.001**
65–69	281 (23.8)	75 (17.3)	206 (27.5)	
70–74	410 (34.7)	147 (33.9)	263 (35.2)	
75–79	293 (24.8)	124 (28.6)	169 (22.6)	
80–84	154 (13.0)	67 (15.5)	87 (11.6)	
≥ 85	43 (3.6)	20 (4.6)	23 (3.1)	
Smoking (recent 6 mo)	43 (3.6)	39 (9.0)	4 (0.5)	<0.001**
Alcohol (recent 6 mo)	105 (8.9)	90 (20.8)	15 (2.0)	<0.001**
Exercise (recent 6 mo)	1065 (89.7)	405 (93.5)	660 (87.4)	0.002**
Living condition			0.002[b,**]	
Alone	100 (8.4)	21 (4.9)	79 (10.5)	
With family	1081 (91.6)	412 (95.1)	669 (89.5)	
Education level			<0.001**	
Illiterate	66 (5.6)	8 (1.9)	58 (7.7)	
Elementary	376 (31.8)	94 (21.6)	282 (37.7)	
Junior high school	212 (18.0)	54 (12.5)	158 (21.2)	
Senior high school	299 (25.3)	128 (29.5)	171 (22.9)	
≥ College	228 (19.3)	149 (34.6)	79 (10.4)	
BMI group				0.009**
BMI < 18.5 kg/m^2	35 (3.0)	5 (1.2)	30 (4.0)	
18.5 ≤ BMI < 24 kg/m^2	529 (44.8)	189 (43.6)	340 (45.5)	
24 ≤ BMI < 27 kg/m^2	397 (33.6)	163 (37.6)	234 (31.2)	
≥ 27 kg/m^2	220 (18.6)	76 (17.6)	144 (19.3)	
Risk factors				
HT	678 (57.4)	227 (52.4)	451 (60.3)	0.013*
HG	626 (53.0)	237 (54.7)	389 (52.0)	0.402
AO	581 (49.2)	135 (31.2)	446 (59.6)	<0.001**
Low HDL-C	299 (25.3)	89 (20.6)	210 (28.1)	0.005*
HTG	258 (21.8)	87 (20.1)	171 (22.9)	0.301
HUA	200 (16.9)	127 (16.4)	73 (18.0)	0.064
Risk factors# (Mean ± SD)	2.07 ± 1.3	1.79 ± 1.2	2.23 ± 1.3	<0.001[a,**]
With-MetS	405 (34.3)	111 (25.6)	294 (39.3)	<0.001**

*p < 0.05.
**p < 0.01.
AO = abdominal obesity (waist circumference ≥ 90 cm for men and ≥80 cm for women); BMI = body mass index; HG = hyperglycemia (fasting plasma glucose ≥ 100 mg/dL or the use of antihyperglycemic agents); HT = hypertension (systolic BP ≥ 130, diastolic BP ≥ 85 mmHg, or the use of antihypertensive agents); HTG = hypertriglyceridemia (TG ≥ 150 mg/dL); low serum HDL-C (HDL-C ≤ 40 mg/dL for men and ≤50 mg/dl for women); MetS = metabolic syndrome.
[a] Student t test was used to compare male and female groups.
[b] Fisher's exact test was used to compare male and female groups.