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Metabolic syndrome: The association of obesity and unhealthy lifestyle among Malaysian elderly people

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ABSTRACT

The aim of this study is to investigate the prevalence of metabolic syndrome (MetS) and its predictors among Malaysian elderly. A total of 343 elderly aged ≥60 years residing low cost flats in an urban area in the central of Malaysia were invited to participate in health screening in community centers. Subjects were interviewed to obtain socio demography, health status and behavior data. Anthropometric measurements were also measured. A total of 30 ml fasting blood was taken to determine fasting serum lipid, glucose level and oxidative stress. MetS was classified according to The International Diabetes Federation (IDF) criteria. The prevalence of MetS was 43.4%. More women (48.1%) were affected than men (36.3%) ($p < 0.05$). Being obese or overweight was the strongest predictor for MetS in men and women ($p < 0.05$, both gender). High carbohydrate intake increased risk of MetS in men by 2.8 folds. In women, higher fat free mass index, physical inactivity and good appetite increased risk of MetS by 3.9, 2.1 and 2.3 folds respectively. MetS affected almost half of Malaysian elderly being investigated, especially women, and is associated with obesity and unhealthy lifestyle. It is essential to develop preventive and intervention strategies to curb undesirable consequences associated with MetS.

1. Introduction

The prolong of population life span has increased the number of elderly people worldwide as well as developing countries including Malaysia (Department of Malaysian Statistic, 2000; Schlenker, 1998). This aging phenomenon has been linked to an increase prevalence of age related diseases, including metabolic syndrome (MetS) which is a great concern in public health (Gu et al., 2005; Yu et al., 2009). MetS is characterized by the presence of multiple risk factors, defined as metabolic disturbances, including central obesity, hypertension, dyslipidemia, hyperglycemia and insulin resistance (Gami et al., 2007; Grundy, 2007). People with this syndrome are at risk of developing diabetes mellitus and cardiovascular diseases (Lakka et al., 2002). The syndrome is also associated with kidney disease and increased risk for mortality from cardiovascular disease (Chen et al., 2004). The prevalence of MetS in different regions depends on defining criteria and in some cases, the definition has been adjusted for waist circumference according to each population cut-off. Among the elderly population, the prevalence of MetS was reported to be higher in US (42.0%) (Ford, Giles, & Dietz, 2002), Turkey (61.7%) (Akbulut et al., 2001) and China (42.7%) (Wang et al., 2010), as compared to Japan (20.1%) (Arai et al., 2010) and Italy (27.2%) (Ravaglia et al., 2006).

Dietary intake and physical activity have both been identified as important determinants of MetS (Freire, Cardoso, Gimeno, & Ferreira, 2005; Roberts, Vaziri, Liang, & Barnard, 2001). Lifestyle changes consistently shown therapeutic effect in reducing prevalence of MetS (Pearson et al., 2002). Over and under nutrition have also been found to increase risk of MetS (Misra, 2002). Understanding the magnitude and risk factors of MetS of a population is essential toward developing national strategies to improve health. The prevalence of MetS was in the ranged of 22.9–37.1% among Malaysian adults (Bee, Kantilal, & Singh, 2008; Mohamud et al., 2010), however, the magnitude of this problem among the elderly population is not widely known.

To our knowledge, only few data exist on the magnitude and predictors of MetS in an Asian elderly population. Thus, this study aimed to determine the magnitude of MetS and its' predictors from a wide range of demography, socioeconomic, lifestyle practices, nutritional status and health risk among elderly people in Malaysia.

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2. Methodology

This cross-sectional study was carried out from December 2008 until May 2009. Ethical approval was obtained from the Medical Research Secretariat, National University of Malaysia Medical Center and informed consent was obtained from all subjects.

2.1. Subjects

Subjects involved in this study were volunteers consist of Malays, Chinese and Indians aged 60 years and above who were able to communicate, residing in low cost flats in an urban area in the central of Malaysia, which is an urban area in the central of Malaysia. Exclusion criteria included those having mental disorders, concomitant diseases (i.e. on dialysis, cancer, and stroke) and being handicapped.

2.2. Demographic, anthropometry, dietary intake, physical activity and appetite

Subjects were gathered at community centers for health screening, starting from an interview session based on a pretested questionnaire to collect data on socio demography (age, gender, ethnic, marital status, education status, monthly household income and social participation) and health status and behavior (smoking habit, physical activity, food intake, self reported chronic disease and medical conditions). The face-to-face interview was conducted by trained fieldworkers.

In particular, dietary intake was assessed based on face-to-face interview using diet history questionnaire (DHQ) (Suzana, Earland, & Suriah, 2000). FoodWorks software was used to obtain basic energy and nutrient intake. The weight for each food items consumed was further converted into household serving size. Physical activity level was assessed using International Physical Activity Questionnaire (IPAQ) (Hagstromer, Oja, & Sjostrom, 2006). A combined MET-min per week score was calculated by multiplying the weekly frequency, duration and intensity of the physical activity. Subjects were classified as having moderate to high physical activity if they engaged with a minimum total physical activity of at least 600 MET-min/week) (Hagstromer et al., 2006). Appetite was measured using the Council of Nutrition Appetite Questionnaire (CNAQ) (Wilson et al., 2005). Subjects with CNAQ score $\leq$28 indicated poor appetite.

Subjects were also measured for anthropometrics included body weight using calibrated weighing scale to the nearest 0.1 kg (TANITA digital lithium scale HD319, TANITA Corporation, Tokyo, Japan), standing height to the nearest 0.1 cm (Leicester Height Measure, CMS Weighing Equipment, United Kingdom), and waist circumference using SECA measuring tape to the nearest 0.1 cm (SECA Corporation, Humberg, German). Body mass index (BMI) was calculated as body weight/standing height (kg/m^2). Anthropometric measurements were carried out using the standard protocol (Lee & Nieman, 1993). Maltron Bio-Scan 916 (Maltron International Ltd., Rayleigh, Essex, United Kingdom) was used to determine body composition i.e. fat free mass using bio-impedance analysis method (www.maltronint.com/portable_products.htm/31-07-2008).

2.3. Clinical, laboratory examination and MetS classification

A total of 30 ml peripheral blood sampling was also performed after 10 h overnight fasting. This includes examination of fasting blood glucose, triglyceride and high density lipoprotein (HDL) level. Oxidative stress were also measured, i.e. lipid hydroperoxide (LPO) and superoxide dismutase (SOD).

MetS was diagnosed according to The IDF consensus worldwide definition of the metabolic syndrome (Alberti, Zimmet, & Shaw, 2005). Based on this definition, a subject is classified as having MetS if they have central obesity (defined as waist circumference $\geq$90 cm for men and $\geq$80 cm for women) plus any combination of two or more the following components: elevated plasma triglycerides (1.7 mmol/L) or specific treatment of this abnormality, reduced HDL cholesterol (<1.0 mmol/L in men and <1.3 mmol/L in women) or specific treatment of this abnormality, raised blood pressure (systolic BP $\geq$ 130 or diastolic BP $\geq$ 85 mm Hg) or treatment of previously diagnosed hypertension, raised fasting plasma glucose ($\geq$5.6 mmol/L) or previously diagnosed type 2 diabetes mellitus.

Weight and height was computed to obtain BMI and further classified according to WHO Expert Consultation (2004). Fat Free Mass Index (FFMI) was also computed based on Schols, Broekhuizen, Weling-Scheepers, & Wouters (2005) definition and subjects were categorized as normal if FFMI $\geq$ 16 kg/m^2.

2.4. Statistical analysis

All analyses were performed using Statistical Analysis for Social Sciences (SPSS) software version 18.0. Descriptive analysis was carried out on demography, anthropometry, dietary intake, clinical and laboratory examination. Prevalence of MetS was presented in percentage. Pearson chi-square was employed to determine the association of related factors to MetS. Binary logistic regression (Enter Method) analysis was employed to determine the relative predictors of MetS at $p < 0.05$.

3. Results

Out of 436 elderly individuals invited to participate in the health screening at respective community centers, 399 (91.5%) elderly had attended the session. However, after being screened, a total of 343 (78.7%) community-dwelling elderly individuals were recruited as subjects for this study. Among the reasons for non participating included being ill, no interest to join the study and busy with work schedule.

Subjects were aged 60–86 years (mean age 66.4 $\pm$ 5.9 years) consists of 135 men and 208 women, with mostly Malays (70.3%), followed by Chinese (25.1%) and Indian (4.7%) (Table 1). Men had a higher education level and household income than women ($p < 0.001$). Prevalence of MetS was 43.4%. The prevalence was higher in Indians (68.8%), followed by Malays (44.4%) and Chinese (36.0%). Women (48.1%) were more likely to be affected by this syndrome than men (36.3%) ($p < 0.05$). Most of subjects were overweight or obese (59.3% men and 60.1% women), followed by normal (36.3% men and 36.1% women) and underweight (4.4% men and 3.8%women). With respect to FFMI category, most of subjects were categorized as normal (80.7% men and 73.6% women), followed by cachexia or low fat free mass (19.3% men and 26.4% women).

In both men and women with MetS, body weight, BMI, waist circumference, and fat percentage were significantly higher ($p < 0.0001$) than those without MetS. The exception was for (FFMI) of which only men with MetS had a higher value ($p < 0.05$) (Table 2). Subjects with MetS, in both gender also had an elevated triglyceride, fasting blood glucose and HbA$_1$c and reduced HDL level ($p < 0.0001$). However, total cholesterol, low density lipoprotein (LDL) level and also oxidative markers (LPO, SOD) were not significantly differ according to MetS status. Subjects with MetS also had a higher systolic and diastolic blood pressure level as compared to those without MetS ($p < 0.01$).

Chi-squared analysis showed that among men, being overweight or obese [Crude Odd Ratio (OR) 16.39 (95% Confidence Interval (CI) 5.41–49.71)] was significantly associated with MetS.