METABOLISM CLINICAL AND EXPERIMENTAL XX (2014) XXX–XXX

Available online at www.sciencedirect.com

Metabolism

www.metabolismjournal.com

Association between habitual daytime napping and metabolic syndrome: a population-based study☆

Diaozhu Lin[1], *Kan Sun*[1], *Feng Li, Yiqin Qi, Meng Ren, Chulin Huang, Juying Tang, Shengneng Xue, Yan Li*[*], *Li Yan*[*]

Department of Endocrinology, Sun Yat-sen Memorial Hospital, Sun Yat-sen University, 107 Yanjiang West Road, Guangzhou 510120, People's Republic of China

ARTICLE INFO

Article history:
Received 15 March 2014
Accepted 8 August 2014

Keywords:
Metabolic syndrome
Sleep
Daytime napping
Night sleeping
Siesta

ABSTRACT

Objective. Our objective was to evaluate the association between habitual daytime napping and the prevalence of metabolic syndrome.

Materials and Methods. We conducted a population-based study of 8,547 subjects aged 40 years or older. Metabolic syndrome was defined according to a harmonized definition from a joint statement and the recommended thresholds for the Chinese population. Information about sleep duration was self-reported.

Results. The prevalence of metabolic syndrome in the no daytime napping group, the 0 to 1 hour daytime napping group and the more than 1 hour daytime napping group were 35.0%, 36.0% and 44.5% among the females ($P < 0.0001$). Increased daytime napping hours were positively associated with parameters of metabolic syndrome in the female subjects, including waist circumference, systolic blood pressure, triglycerides and fasting plasma glucose ($P < 0.05$ for all). Multivariate adjusted logistic regression analysis revealed that, compared to the no habitual daytime napping females, napping for more than 1 hour was independently associated with an increased prevalence of metabolic syndrome (odds ratio 1.39, 95% confidence interval, 1.13–1.72). Compared to the female subjects in the no daytime napping group, those habitually napped for more than 1 hour exhibited 46% and 26% increases in the prevalence of central obesity and hypertriglyceridemia (all $P < 0.05$). No statistically significant associations were detected between daytime napping hours and metabolic syndrome among the male subjects.

Conclusion. Daytime napping is associated with an increased prevalence of metabolic syndrome in middle-aged non-obese Chinese women.

Abbreviations: MET-h/week, metabolic equivalent hours per week; BMI, body-mass index; WC, waist circumference; FPG, fasting plasma glucose; HbA1c, Hemoglobin; TG, triglycerides; TC, total cholesterol; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; HOMA-IR, homeostasis model assessment of insulin resistance; SBP, systolic blood pressure; DBP, diastolic blood pressure; SD, standard deviation; ORs, odds ratios; CI, confidence intervals.

☆ Statement of authorship: All authors believe that this manuscript represents valid work and have reviewed and approved the final version. The work has not been published previously and is not under consideration for publication elsewhere in part or in whole.

* *Corresponding authors at:* No. 107 Yan jiang West Road, Guangzhou, 510120, China. Tel.: +86 20 81332518; fax: +86 20 81332042.
E-mail address: hfxyl@163.net (L. Yan).

[1] Diaozhu Lin and Kan Sun contributed equally to this work.

http://dx.doi.org/10.1016/j.metabol.2014.08.005
0026-0495/

1. Introduction

Metabolic syndrome is a widely recognized concept that includes a constellation of various metabolic abnormalities and confers an increased risk for all-cause mortality [1]. In the last decade, the prevalence of metabolic syndrome decreased from 25.5% to 22.9% in the U.S. adult population [2]. However, over the same time period, the prevalence of metabolic syndrome increased from 50.4% in 2001 to 58.1% in 2010 among the elderly Chinese [3]. Despite the numerous therapeutic options for the management of metabolic syndrome, lifestyle modification remains the primary prevention strategy for this condition and its related diseases [4, 5].

Habitual daytime napping (siesta) is prevalent in China and is traditionally considered to be a part of a healthy lifestyle [6, 7]. Naska et al. [8] reported that there is a 34% decreased in the risk of mortality due to coronary heart diseases among healthy individuals who take daytime naps compared to those who do not. However, contradictory results have been reported in recent studies. In a large cohort study, Tanabe et al. [9] showed that daytime napping was associated with an elevated risk of mortality related to cardiovascular diseases among 67,129 Japanese people over a 15-year follow-up. Additionally, a recent study found that daytime napping and shorter night time sleeping are associated with an increased risk of diabetes in the older population in the US [10]. The authors speculated that daytime napping habits might have been the major modifier of the observed association. Indeed, increased rates of impaired fasting plasma glucose and diabetes were found to associated with longer daytime napping in a population of adults in China [11]. Given the high prevalence of daytime napping in China, it is of great interest to understand the health benefits and hazards of habitual daytime napping.

A previous study found that there is a U-shaped association between night sleep duration and metabolic syndrome in patients with type 2 diabetes [12]. However, to our knowledge, no study of the relationship between daytime napping and metabolic syndrome is currently available. Here, we analyzed data from a Chinese community to explore the possible relationship between daytime napping and the prevalence of metabolic syndrome.

2. Subjects and methods

2.1. Study population and design

We performed a cross-sectional study in a community in Guangzhou, China from June to November, 2011. The study population was from the Risk Evaluation of cAncers in Chinese diabeTic Individuals: A lONgitudinal (REACTION) study, which was been set up as a multicenter prospective observational study with the aim of evaluating chronic diseases in the Chinese population [13, 14]. During the recruiting phase, a total of 10,104 residents aged 40 years or older were invited to participate by examination notices or home visits. In total, 9916 subjects signed the consent form and agreed to participate in the survey, and the participation rate was 98.1%. The subjects who failed to provided information about metabolic syndrome status (n = 74) or sleep status (daytime napping hours missing: n = 881; night sleeping hours missing: n = 414) were excluded from the analyses. The baseline data were compared between the included subjects and those excluded for missing information, and the results are presented in supplementary Table. A total of 8,547 eligible individuals were included in the final data analyses. The study protocol was approved by the Institutional Review Board of the Sun Yat-sen Memorial Hospital affiliated with Sun Yat-sen University and was in accordance with the principles of the Helsinki Declaration II. Written informed consent was obtained from each participant prior to data collection.

2.2. Clinical and biochemical measurements

We collected information about lifestyle factors, medical histories, sociodemographic characteristics and family histories by using a standard questionnaire. Smoking or drinking habits were classified as 'never', 'current' (smoking or drinking regularly in the past 6 months) or 'ever' (cessation of smoking or drinking of more than 6 months) [5]. A short form of the International Physical Activity Questionnaire (IPAQ) was used to estimate physical activity during leisure time by adding the results for questions about the frequency and duration of moderate or vigorous activities and walking [15]. Metabolic equivalent hours per week (MET-h/week) were calculated separately to evaluate total physical activity.

All participants completed the anthropometrical measurements with the assistance of trained staff using standard protocols [14, 16]. Blood pressure was measured three times consecutively by the same observer with 5 minute intervals using an automated electronic device (OMRON, Omron Company, China). The average of the three measurements of blood pressure was used for the analysis. Body height and body weight were recorded to the nearest 0.1 cm and 0.1 kg, respectively, while participants were wearing light indoor clothing without shoes. Body mass indices (BMI) were calculated as the weight in kilograms divided by the height in meters squared (kg/m^2). Obesity was defined by BMI equal to or greater than 28, and overweight was defined by BMI equal to or greater than 24 and less than 28 [17, 18]. Waist circumference (WC) was measured at the umbilical level with participant in the standing position at the end of a gentle expiration.

Venous blood samples were collected for laboratory tests after an overnight fasting of at least 10 h. Measurements of fasting serum insulin, fasting plasma glucose (FPG), triglycerides (TG), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C) and creatinine were performed with an autoanalyzer (Beckman CX-7 Biochemical Autoanalyser, Brea, CA, USA). Hemoglobin A1c (HbA1c) was assessed by high-performance liquid chromatography (Bio-Rad, Hercules, CA). The insulin resistance index (homeostasis model assessment of insulin resistance, HOMA-IR) was calculated as fasting insulin (μIU/ml) × fasting glucose (mmol/L)/22.5 [19]. Insulin resistance was defined by a HOMA-IR index within the top quartile (greater than 2.54 in the present study) [20].

Please cite this article as: Lin D, et al, Association between habitual daytime napping and metabolic syndrome: a population-based study, Metabolism (2014), http://dx.doi.org/10.1016/j.metabol.2014.08.005