Self-Reported Long Total Sleep Duration Is Associated With Metabolic Syndrome

The Guangzhou Biobank Cohort Study

OBJECTIVE—To examine the association between total sleep duration and the prevalence of metabolic syndrome (MetSyn) in older Chinese.

RESEARCH DESIGN AND METHODS—Cross-sectional analysis of baseline data from the Guangzhou Biobank Cohort Study (GBCS) was performed. Participants (n = 29,333) were aged ≥50 years. Risk of MetSyn and its components were identified for self-reported total sleep duration.

RESULTS—Participants reporting long (≥9 h) and short (<6 h) total sleep duration had increased odds ratio (OR) of 1.18 (95% CI 1.07–1.30) and 1.14 (1.05–1.24) for the presence of MetSyn, respectively. The relationship remained in long sleepers (OR 1.21 [1.10–1.34]) but diminished in short sleepers (0.97 [0.88–1.06]) after full adjustment.

CONCLUSIONS—Long sleep duration was associated with greater risk of MetSyn in older Chinese. Confirmation through longitudinal studies is needed. The mechanisms mediating the link between long sleep duration and MetSyn require further investigation.

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Factors contributing to metabolic syndrome (MetSyn) (1) pathogenesis are poorly understood. Sleep duration has been suggested as a potential risk factor for MetSyn and/or its components, but few studies that examine the relationship between sleep duration and MetSyn report heterogeneous findings (2–5). We examined the association between total self-reported sleep duration and prevalence of MetSyn in older Chinese from the Guangzhou Biobank Cohort Study (GBCS).

RESEARCH DESIGN AND METHODS—The Guangzhou Medical Association Ethics Committee approved the GBCS, described previously (6). GBCS participants (n = 30,519) underwent, after written consent, a half-day assessment, including structured interview and physical examination.

Sleep habits
A nurse-led interview included questions on total sleep duration (including daytime naps) in a 24-h period. Total sleep duration was categorized into <6 h, 6 to <7 h, 7 to <8 h, 8 to <9 h, and ≥9 h. Data were collected on snoring (yes/no/don’t know), current hypnotic use (yes/no), insomnia (taking >30 min to initiate sleep, yes/no), and daytime sleepiness (yes/no).

MetSyn
MetSyn was defined according to the consensus statement (1). MetSyn was assessed after an overnight fast. Mean blood pressure was calculated from the last two of three consecutive readings. Height, weight, and waist circumference were measured.

Other measures
Self-reported information included age, sex, smoking (never/ever), and alcohol consumption (never/ever). Physical activity was assessed using the previously validated International Physical Activity Questionnaire (short version) (7) (inactive/minimally active/active). Educational level (primary or below/secondary/tertiary or above) was proxy for socioeconomic status.

Health status was assessed objectively (hospital admission in previous 6 months) and subjectively (four-scale rating: very good/good/very poor/poor). Participants reported on cancer (any type, yes/no) and/or past/present physician-diagnosed cardiovascular disease (yes/no).

All analyses used SPSS software (version 15.0). Logistic regression analyses were conducted to determine risk of MetSyn and its components by sleep duration categories.

RESULTS—Of the total sample, 29,333 (21,239 women and 8,094 men) had complete information on all variables of interest and were included for analyses. Participants’ age ranged from 50 to 96 years; men were slightly older (63.9 ± 6.7 years [mean ± SD]) than women (60.6 ± 7.1 years).

Total sleep duration of <6 h (“short” sleepers) was reported by 13.5% of participants, while 8.8% reported sleep duration of ≥9 h (“long” sleepers). Study population characteristics according to

From the 1Birmingham and Black Country National Institute for Health Research Collaborations for Leadership in Applied Health Research and Care, University of Birmingham, Birmingham, U.K.; the 2School of Clinical and Experimental Medicine, College of Medical and Dental Sciences, University of Birmingham and Heartlands Biomedical Research Centre, Birmingham, U.K.; the 3Guangzhou Number 12 People’s Hospital, Guangzhou, China; the 4Department of Public Health, Epidemiology and Biostatistics, University of Birmingham, Birmingham, U.K.; the 5Institute of Occupational and Environmental Medicine, University of Birmingham, Birmingham, U.K.; and the 6School of Public Health, The University of Hong Kong, Hong Kong.

Corresponding author: G. Neil Thomas, gneilthomas@yahoo.co.uk.

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A list of the members of the Guangzhou Biobank Cohort Study can be found in the appendix. © 2011 by the American Diabetes Association. Readers may use this article as long as the work is properly cited, the use is educational and not for profit, and the work is not altered. See http://creativecommons.org/licenses/by-nc-nd/3.0/ for details.

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**CONCLUSIONS** — Our results demonstrate that self-reported long sleep duration is independently associated with increased risk for MetSyn. Adjusted age analysis revealed a small increased risk for MetSyn among long-aged participants. Long sleep duration was associated with increased odds of MetSyn (OR, 1.25; 95% CI, 1.09–1.42; respectively). Older participants (≥65 years) had increased odds of MetSyn (OR, 1.30; 95% CI, 1.19–1.41), while older participants (≥75 years) had increased odds of MetSyn (OR, 1.33; 95% CI, 1.11–1.59). In Supplementary Table 3, middle-aged participants (18–39 years) had increased risk of MetSyn, compared with those reporting good health (OR, 1.06; 95% CI, 1.00–1.12). Likewise, ORs across all sleep duration categories remained similar across sleep duration categories.

As sleep duration declined with age (data not shown), the analysis was repeated stratifying by age (median split; Supplementary Table 4). Middle-aged participants (18–39 years) had increased sleep duration compared with those reporting good health (OR, 1.17; 95% CI, 1.08–1.25), while older participants were at increased risk for elevated triglycerides. There were significantly increased levels of MetSyn (1.99; 95% CI, 1.21–2.58) and reduced HDL cholesterol (OR, 1.17; 95% CI, 1.12–1.24) in older participants. A higher proportion of those who reported a diagnosis of diabetes, hypertension, or coronary artery disease were at increased risk for elevated triglycerides and central obesity in the older age group ( Supplementary Table 4). Logistic regression analysis revealed middle-aged participants (18–39 years) with long sleep duration had increased odds of MetSyn (OR, 1.17; 95% CI, 1.06–1.89), while older participants (≥65 years) had increased odds of MetSyn (OR, 1.34; 95% CI, 1.17–1.53). Unlike previous studies, after adjustment, long sleep was associated with lower risk of elevated triglycerides (OR, 0.97; 95% CI, 0.89–1.07) and increased risk for MetSyn (OR, 1.17; 95% CI, 1.06–1.28). Table 1 shows a statistically significant association between long sleep duration and MetSyn (OR, 1.16; 95% CI, 1.08–1.25) and reduced HDL cholesterol (OR, 1.17; 95% CI, 1.12–1.24).

A higher proportion of those who reported a diagnosis of diabetes, hypertension, or coronary artery disease were at increased risk for elevated triglycerides and central obesity in the older age group. These results demonstrate a higher prevalence of MetSyn and reduced HDL cholesterol in older participants with long sleep compared with those reporting good health (OR, 1.99; 95% CI, 1.21–2.58) and reduced HDL cholesterol (OR, 1.17; 95% CI, 1.12–1.24). We report a higher proportion of those who reported a diagnosis of diabetes, hypertension, or coronary artery disease were at increased risk for elevated triglycerides and central obesity in the older age group. These results demonstrate a higher prevalence of MetSyn and reduced HDL cholesterol in older participants with long sleep compared with those reporting good health (OR, 1.99; 95% CI, 1.21–2.58) and reduced HDL cholesterol (OR, 1.17; 95% CI, 1.12–1.24). We report a higher proportion of those who reported a diagnosis of diabetes, hypertension, or coronary artery disease were at increased risk for elevated triglycerides and central obesity in the older age group. These results demonstrate a higher prevalence of MetSyn and reduced HDL cholesterol in older participants with long sleep compared with those reporting good health (OR, 1.99; 95% CI, 1.21–2.58) and reduced HDL cholesterol (OR, 1.17; 95% CI, 1.12–1.24).
MetSyn and its components (2,8,9), possibly because of relationships diminishing with age (10).

Studies of sleep duration and MetSyn have produced inconsistent findings (2–5). Our study is in line with those indicating that long sleep is a potential risk factor for MetSyn (3,4) and supports a link between long sleep and increased IFG risk (9,11). Obstructive sleep apnea (OSA) may be responsible for the association (12). Although OSA diagnosis was unavailable, adjustment for snoring and daytime sleepiness—features of OSA—did not alter the relationship between long sleep and IFG. Longer sleep could be associated with circadian and/or hormonal alterations promoting insulin resistance. Conversely, chronic inflammation accompanying obesity may increase sleep duration as a result of metabolic and sleep-inducing effects of proinflammatory cytokines.

Some have reported a U-shaped association between sleep duration and adiposity (8). We confirmed the relationship between central obesity and long sleep duration only. Long sleepers have less waking time to undertake physical activity, which may contribute to this association. We controlled for physician-diagnosed mental illness: depression, previously linked to long sleep and obesity, is therefore unlikely to be responsible for the relationship.

In agreement with a recent study reporting an OR of 1.45 (95% CI 1.00–2.11) for elevated triglycerides in long sleepers (13), we found an independent relationship between long sleep and elevated triglycerides in the total sample, with older participants driving this observation.

Sleep duration and quality decline with age, while disease prevalence increases. To address the possibility of long sleep being a consequence of ill health, we repeated analyses in a healthy subsample. The relationships between sleep and MetSyn and most of its components remained after adjustment.

We report an association between long sleep and higher MetSyn prevalence in older Chinese. Prospective and mechanistic studies are needed to assess this further. With emerging obesity, MetSyn, and diabetes epidemics associated with rapid socioeconomic transition, particularly in Asia, if long sleep were shown to increase MetSyn risk, our findings would have important public health implications.

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APPENDIX—Members of the GBCS include Guangzhou Number 12 People’s Hospital: W.S. Zhang, M. Cao, T. Zhu, B. Liu, and C.Q. Jiang (Co-PI); The University of Hong Kong: C.M. Schooling, S.M. McGhee, R.F. Fielding, G.M. Leung, and T.H. Lam (Co-PI); and University of Birmingham: G.N. Thomas, P. Adab, and K.K. Cheng (Co-PI).

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