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

The Guangzhou Biobank Cohort Study

TERESA ARORA, BSc1,2
CHAO QIANG JIANG, MD3
G. NEIL THOMAS, PhD4
KIN-BONG HUBERT LAM, PhD5
WEI SEN ZHANG, MD, PhD3
KAR KEUNG CHENG, MBBS, PhD4
TAI HING LAM, MD6
SHAHRAD TAHERI, MBBS, PhD1,2

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.

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 the 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).

The Guangzhou Biobank Cohort Study (GBCS) is a collaborative project involving the Birmingham and Black Country National Institute for Health Research Collaborations for Leadership in Applied Health Research and Care, University of Birmingham, Birmingham, U.K.; the School of Clinical and Experimental Medicine, College of Medical and Dental Sciences, University of Birmingham and Heartlands Biomedical Research Centre, Birmingham, U.K.; the Guangzhou Number 12 People’s Hospital, Guangzhou, China; Public Health, Epidemiology, and Biostatistics, University of Birmingham, Birmingham, U.K.; the Institute of Occupational and Environmental Medicine, University of Birmingham, Birmingham, U.K.; and the School of Public Health, University of Hong Kong, Hong Kong.

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

Received 5 April 2011 and accepted 26 July 2011.

DOI: 10.2337/dc11-0647

This article contains Supplementary Data online at http://care.diabetesjournals.org/lookup/suppl/doi:10.2337/dc11-0647/-/DC1.

Views expressed in this publication are not necessarily those of the National Institute for Health Research, Department of Health, or National Health Service.

© 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.
CONCLUSIONS. Our results demonstrate that long sleep duration is associated with a small increased risk for MetSyn. Adjusted age analyses revealed increased odds of MetSyn (OR 1.181-1.37) while older age of MetSyn was associated with long sleep duration. A higher proportion of those who reported poor health had MetSyn (31.9%) between other components and longest sleep duration are shown in Supplementary Table 2. Likewise, ORs across all MetSyn components remained similar across sleep duration categories. As such, duration declined with age (data not shown), the analysis was conducted for MetSyn participants (>60 years) by median age categories (Supplementary Table 3). Middle-aged participants (≥60-69 years) had the lowest sleep duration (4 h). Meanwhile, the mean systolic blood pressure, glucose, total cholesterol, and triglycerides were 113 (95% CI 1.08-1.23) and 0.92 (0.84-1.00) for the observed association. Therefore, a healthy subsample was identified, including those with hospital admissions for all-cause mortality and use of antipsychotic drugs. There were significant associations between other components and MetSyn (OR 1.1695% CI 1.08-1.25). Redefined sleep duration of MetSyn (<6 with MetSyn was slightly attenuated (1.19 95% CI 1.08-1.34), after adjustment, short sleep was unrelated to risks for MetSyn, while older age of MetSyn was associated with long sleep duration. A higher proportion of those who reported poor health had MetSyn (31.9%) between other components. Additional analysis revealed middle-aged participants (60-69 years) with longest sleep had increased odds of MetSyn (OR 1.18-1.37), while older age of MetSyn was associated with long sleep duration. A higher proportion of those who reported poor health had MetSyn (31.9%) between other components. Additional analysis revealed middle-aged participants (60-69 years) with longest sleep had increased odds of MetSyn (OR 1.18-1.37), while older age of MetSyn was associated with long sleep duration. A higher proportion of those who reported poor health had MetSyn (31.9%) between other components. Additional analysis revealed middle-aged participants (60-69 years) with longest sleep had increased odds of MetSyn (OR 1.18-1.37), while older age of MetSyn was associated with long sleep duration.
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.

Acknowledgments—The GBCS was funded by the University of Hong Kong Foundation for Educational Development and Research, Hong Kong, the Guangzhou Public Health Bureau and the Guangzhou Science and Technology Bureau, China; and University of Birmingham. S.T. has received support from the U.K. National Institute for Health Research through the Collaborations for Leadership in Applied Health Research and Care (CLAHRC-BBC).

No potential conflicts of interest relevant to this article were reported.

T.A. analyzed data, wrote the manuscript, and reviewed and edited the manuscript. C.Q.J. collected data and reviewed the manuscript. G.N.T. led the statistical analysis, wrote the manuscript, and reviewed and edited the manuscript. K.-b.H.L. assisted with data analysis and edited the manuscript. W.S.Z. collected data and reviewed the manuscript. K.K. C. and T.H.L. reviewed and edited the manuscript. S.T. analyzed data, wrote the manuscript, and reviewed and edited the manuscript.

The authors thank the Guangzhou Health and Happiness Association for the Respectable Elders participant recruitment.

APPENDIX—Members of the GBCS include Guangzhou Number 12 People’s Hospital: Zhang, Cao, Zhu, Liu, and Jiang (Co-PI); University of Hong Kong: Schooling, McGhee, Fielding, Leung, and Lam (Co-PI); and University of Birmingham: Thomas, Adab, and Cheng (Co-PI).

References
2. Hall MH, Muldoon MF, Jennings JR, Buyssse DJ, Flory JD, Manuck SB. Self-reported sleep duration is associated with the metabolic syndrome in midlife adults. Sleep 2008;31:635–643
8. Taheri S, Lin L, Austin D, Young T, Mignot E. Short sleep duration is associated with reduced leptin, elevated ghrelin, and increased body mass index. PLoS Med 2004;1:e62