Original Article

Night Sleep Duration and Risk of Cognitive Impairment in a Chinese Population: A Cross-sectional Study

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Abstract

Objective Although sleep is one of the most important health-related behavioral factors, the association between night sleep duration and cognitive impairment has not been fully understood. A cross-sectional study was conducted with a random sample of 2,514 participants (≥ 40 years of age; 46.6% women) in China to examine the association between night sleep duration and cognitive impairment.

Methods Night sleep duration was categorized as ≤ 5, 6, 7, 8, or ≥ 9 h per night. Cognitive function was measured using the Mini-Mental State Examination. A multivariate regression analysis was used to analyze the association of night sleep duration with cognitive impairment. A total of 122 participants were diagnosed with cognitive impairment.

Results A U-shaped association between night sleep duration and cognitive impairment was found. The odds ratios (95% confidence intervals) of cognitive impairment (with 7 h of daily sleep being considered as the reference) for individuals reporting ≤ 5, 6, 8, and ≥ 9 h were 2.14 (1.20-3.83), 1.13 (0.67-1.89), 1.51 (0.82-2.79), and 5.37 (1.62-17.80), respectively ($P \leq 0.01$).

Conclusion Short or long night sleep duration was an important sleep-related factor independently associated with cognitive impairment and may be a useful marker for increased risk of cognitive impairment.

Key words: Night sleep duration; Cognitive; Impairment; Cross-sectional

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INTRODUCTION

A number of epidemiological studies have investigated an association of self-reported sleep duration and risk of diabetes[1-2], hypertension[3-4], myocardial infarction[5-6], stroke[7-8], and mortality[9-10]. With increasing life expectancy in many societies, cognitive impairment or neurodegenerative disease has become a growing problem. Esposito and Carotenuto found that sleep was associated with cognition processes, particularly in cognitive borderline dysfunction[11-12]. Moreover, more and more researchers have begun to explore the

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association between night sleep duration and cognitive impairment, and a commonly reported finding is that both short and long sleep duration is associated with cognitive impairment[13-19]. However, the evidence is mixed and inconsistent regarding the association of sleep duration with the risk of cognitive impairment. Different cross-sectional studies have suggested that only long night sleep duration[15-16,20], only short night sleep duration[17,19,21], or both short and long sleep duration (U-shaped relationship or V-shaped relationship)[13,18,22] was associated with an increased risk of cognitive impairment. In addition, a small number of longitudinal studies have begun to examine whether habitual short or long night sleep duration increases the risk for cognitive decline[23-25] in the elderly, but the results were also mixed. Recently, a cross-sectional study from southern China showed that short or long night sleep duration was an important sleep-related factor independently associated with memory impairment in older people (50-85 years of age)[13]. It is evident that lifestyle, living conditions, and food intake differs between southern and northern Chinese populations. And in their study[13], carotid plaque, a very important factor with respect to cognitive impairment[26], was not considered a confounding factor. It is still unknown whether there is an association between night sleep duration and cognitive impairment in people in northern China. Therefore, we used data from the Kailuan Study to explore whether night sleep duration is associated with cognitive impairment.

METHODS

Study Design and Participants

We conducted a cross-sectional analysis of baseline data in the Asymptomatic Polyvascular Abnormalities Community (APAC) Study. The APAC Study is a community-based, ongoing observational study that aims to investigate asymptomatic polyvascular abnormalities in Chinese adults[27]. From June 2010 to June 2011, 7,000 eligible adults over 40 years of age (stratified by age and sex) were randomly sampled from a reference population of 101,510 participants (20,400 women and 81,110 men, aged 18-98 years) who had been participating in a long-term follow-up study (Kailuan Study[28]) since 2006 in the Kailuan Coal Group in Tangshan, a modern coastal city in northern China. The sample size was calculated based on detection of a 7% event rate with 0.7% precision and an α value of 0.05. The response rate was assumed to be > 80%. A total of 5,852 individuals agreed to participate in the APAC Study and 5,816 people eventually completed the baseline data collection. Among these 5,816 individuals, 376 subjects did not meet the following inclusion criteria: (1) no history of stroke, transient ischemic attack, or coronary disease at baseline as assessed by a validated questionnaire; and (2) absence of neurologic deficits for stroke as estimated by experienced doctors. Finally, 5,440 participants were eligible and included in the APAC Study[29]. After excluding individuals with missing data for the Mini-Mental State Examination (MMSE) or sleep duration (n = 2,926), 2,514 participants remained in the analysis (1,172 women and 1,342 men) (Figure 1). The study was approved by the Ethics Committee of Kailuan General Hospital, following the guidelines outlined by the Helsinki Declaration. All participants agreed to participate in this study and provided written informed consent.

Assessment of Night Sleep Duration

Night sleep duration was obtained through a self-reported answer to the question, 'How many hours of sleep did you have on an average night in the preceding 3 months?' Based on participants' responses, sleep duration was categorized into five groups: ≤ 5, 6, 7, 8, and ≥ 9 h[30].

Neuropsychological Evaluation

Cognitive function was measured using the MMSE in 2012. The MMSE is a measure of general cognitive function and includes orientation to time and place, attention and calculation, language, and memory[31]. Higher scores indicate greater cognitive function. Cognitive impairment was defined as a score of < 24.

Assessment of Potential Covariates

All participants underwent a clinical examination and a standardized interview. The information on physical activity, smoking, and drinking status was evaluated as detailed previously[30]. Education level was categorized as illiteracy or primary, middle school, and high school or above. The family per-member monthly income was categorized as < ¥1,000, ¥1,000-3,000, or ≥ ¥3,000. Anthropomorphic parameters such as body height and weight and waist circumference were measured. Body weight