Sleep Duration and Obesity in Middle-aged Australian Adults

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The present study examined the association between sleep duration and obesity in 40,834 middle-aged Australian adults. Multinomial logistic regression was used to test the relationship between sleep duration and obesity while controlling for important demographic and health covariates; separate models were tested for males and females. Short sleep (i.e., <7 h a night) was found to be independently associated with obesity in males and females. To our knowledge, this is the first study to report an association between short sleep and obesity in Australian adults. Although more research is required, interventions targeting short sleep could aid obesity treatment and prevention.

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The prevalence of obesity has increased rapidly in Australia in recent decades, with ~60% of adults estimated to be overweight or obese (1). Physical inactivity and high fat diets are considered to be two of the major causes of the current obesity epidemic (2). However, emerging data also suggest that short sleep (i.e., <7 h sleep a night) could contribute to the development of obesity (3,4), thus having important implications for obesity management and prevention.

To our knowledge, the association between short sleep and obesity has not been previously examined in a sample of Australian adults. Therefore, the purpose of the present study was to investigate the possible association between short sleep and obesity in a large sample of middle-aged Australian adults, where the prevalence of obesity is particularly high (1). We also examined whether this relationship was different in males and females (5).

METHODS AND PROCEDURES

The present paper used data collected through the 45 and Up Study (a health survey administered to adults aged 45 years and over residing in New South Wales, Australia). The methods of this study are reported in more detail elsewhere (6). The present analysis included data from all participants in the baseline dataset (collected between 2006 and 2008) aged 45–65 years. This resulted in a sample size of 40,834 (21,804 females and 19,030 males).

All variables, except for geographic description of residence, were derived from a self-report questionnaire. BMI was used to categorize individuals as underweight (BMI <18.5), normal weight (BMI ≥18.5, <25.0), overweight (BMI ≥25.0, <30.0), or obese (BMI ≥30) (2). Sleep duration (night time sleep and naps) was categorized as <6 h, 6 h (≥6 h, <7 h), 7 h (≥7 h, <8 h), 8 h (≥8 h, <9 h) and ≥9 h.

The following covariates were also included: age; gender; country of birth; education; marital status; work hours; income status; geographic description of residence; moderate physical activity; alcohol consumption; smoking status; fruit and vegetable intake; screen time (television viewing, computer usage); recent treatment for depression or anxiety; previous diagnosis of heart disease, stroke, diabetes, breast cancer (females only) and prostate cancer. Females also indicated if they had been through menopause, or had ever used hormone replacement therapy or a birth control pill.

The data were analyzed using multinomial logistic regression models whereby sleep duration and other identified covariates were entered to predict body weight status, with separate models tested for males and females. The data were analyzed using SPSS, version 15 (SPSS, Chicago, IL) with results reported as adjusted odds ratios (ORs) (with 95% confidence intervals (CIs)).

RESULTS

A total of 23.3% females and 23.4% of males were obese, with 15.5% of females and 17.4% of males reporting short sleep (<7 h sleep a night). As shown in **Table 1**, compared to 7 h sleep, <6 h (adjusted OR = 1.42, 95% CI = 1.16–1.75) and 6 h sleep a night (OR = 1.35, 95% CI = 1.19–1.52) were associated with increased odds of obesity in females. Similarly, in males, <6 h (OR = 1.72, 95% CI = 1.34–2.20) and 6 h (OR = 1.51, 95% CI = 1.32–1.73) were significantly associated with an increased likelihood of obesity. The relationship between long sleep and obesity was different in males and females. For example, ≥9 h sleep was associated with obesity in males (OR = 1.24, 95% CI = 1.08–1.44), but there was no evidence of this association in females.

DISCUSSION

The present study is the first to examine the association between sleep duration and obesity in a sample of middle-aged Australian adults. Consistent with studies from other countries (3), short sleep (i.e., <7 h sleep) was associated with obesity in both males and females, whereas long sleep (i.e., ≥9 h sleep) was associated with obesity in males only. These results suggest a slight sex difference in the nature of the association between sleep duration and obesity, which supports some previous studies (5).

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Table 1 Sleep duration predicting body weight status in males and females

	Sample size		Underweight		Overweight		Obese	
	n	%	OR[a]	95% CI	OR[a]	95% CI	OR[a]	95% CI
Sleep duration (males)								
<6 h	582	3.1	3.01*	1.38, 6.59	1.22	0.97, 1.53	1.72*	1.34, 2.20
6 h	2,713	14.3	1.60	0.87, 2.93	1.26*	1.12, 1.41	1.51*	1.32, 1.73
7 h	5,833	30.7	referent		referent		referent	
8 h	7,520	39.5	1.10	0.66, 1.83	1.05	0.97, 1.14	1.09	0.99, 1.21
≥9 h	2,382	12.5	1.69	0.92, 3.11	1.07	0.95, 1.21	1.24*	1.08, 1.44
Sleep duration (females)								
<6 h	697	3.2	0.96	0.50, 1.84	1.02	0.83, 1.24	1.42*	1.16, 1.75
6 h	2,688	12.3	1.37	0.97, 1.96	1.08	0.97, 1.21	1.35*	1.19, 1.52
7 h	6,022	27.6	referent		referent		referent	
8 h	9,244	42.4	0.95	0.72, 1.26	0.99	0.92, 1.07	0.96	0.88, 1.05
≥9 h	3,153	14.5	1.22	0.86, 1.73	0.98	0.88, 1.09	1.04	0.92, 1.17

CI, confidence intervals; OR, odds ratio.
[a]Adjusted for age, gender, country of birth, education level, marital status, work hours, income status, geographic description of residence, moderate physical activity, alcohol consumption, smoking status, fruit and vegetable intake, screen time, recent treatment for depression/anxiety and chronic health conditions.
*$P < 0.017$ (α was adjusted to reduce the risk of type 1 errors associated with performing multiple tests (i.e., $\alpha = 0.05/3$)).

The cross-sectional nature of the data hinders the determination of the direction of causation. This is important because the association between short sleep and obesity is likely to be bidirectional. For example, obesity can limit sleep duration because of discomfort and sleep disturbances caused by comorbid conditions such as diabetes and cardiovascular disease. Conversely, data indicate that short sleep predicts long-term weight gain (7,8), possibly by altering neuroendocrine hormones (e.g., leptin and ghrelin) involved in weight regulation in a manner predictive of weight gain and obesity (4). This suggests that short sleep is a risk factor for obesity and may play a role in obesity treatment and prevention alongside other risk factors such as physical activity and diet. The implications of the association between long sleep and obesity observed in males are less clear, but long sleep is most likely a consequence, rather than a cause, of obesity and related conditions (e.g., sleep apnea) (9).

The main strengths of the present study were the large sample size and inclusion of a vast array of covariates. The results therefore clearly demonstrate independent associations between short sleep and obesity in the present sample of middle-aged Australian adults. However, the use of cross-sectional data and the reliance on self-report data (the precision of which is affected by factors such as gender, education and cultural background) are potential limitations. Therefore, the association between sleep duration and obesity requires further investigation through longitudinal studies using more objective measures of sleep, body composition, and other health-related variables. This research will clarify the extent to which short sleep contributes to obesity, and may lead to the development of more effective public health campaigns to combat obesity in Australia and other countries.

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DISCLOSURE

The authors declared no conflict of interest.

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