



Original Article

Sleep duration pattern and chronic diseases in Brazilian adults (ISACAMP, 2008/09)

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ABSTRACT

Objective: The aim of the present study was to assess sleep patterns in the adult population of the city of Campinas (Brazil) according to socioeconomic/demographic variables, chronic diseases, and symptoms. **Methods:** A population-based cross-sectional study was conducted using data from the Campinas Health Survey (ISACAMP) carried out in 2008 and 2009. A total of 2637 individuals aged 18 years or older (obtained from a probabilistic sample) were analyzed. Associations between sleep pattern and the independent variables were determined using the chi-square test. Multinomial logistic regression models were used to adjust for confounders.

Results: The prevalence of six or fewer hours of sleep was greater among individuals aged 40 years or older and among divorced or single individuals. The sleep pattern of nine or more hours was more prevalent among those with less than 40 years of age, among those who were divorced, or single, among those with a lower level of schooling, those who did not work and housewives. Both short and long sleep patterns were more prevalent among individuals with heart disease, vascular problems, rheumatism/arthritis/arthritis, osteoporosis, or emotional problems. The prevalence of the short sleep duration was greater among individuals with back problems and those with three or more health conditions. A strong association was found between sleep duration and sleep quality.

Conclusions: Socio-demographic factors and health diseases were associated to sleep duration. This issue should be considered in health promotion strategies.

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1. Introduction

Sleep is a state in which a process of daily restoration occurs. Sleep disorders and a lack of sleep are associated with psychiatric and physiological problems and may affect endocrine, immunological, and metabolic processes, with a consequent impact on quality of life, memory/concentration, and mood, as well as an increased risk of accidents, illness, and even death [1–3].

Despite individual variations, 7–8 h within a 24-h period is considered the best length of time for sleep to fulfill its function in the maintenance of physical and mental health [4–6]. In the United States, data from the National Health Interview Survey carried out between 2004 and 2007 reveal that 28.3% of the American population aged 18 years or older maintain a sleep pattern of six or fewer hours daily, 63.3% sleep 7–8 h and 8.5% sleep nine or more hours [7].

A number of studies have demonstrated that demographic and socioeconomic factors are associated with sleep duration. Compared to women, a greater percentage of men maintain a medium sleep pattern (7–8 h) [5]. Individuals who do not work tend to

sleep longer, whereas the medium sleep pattern is more prevalent among those with higher levels of schooling and income [5,7]. Marital status and ethnic background are also associated with sleep duration [5,8,9].

There is evidence that short (six or fewer hours) and long (nine or more hours) sleep patterns are associated with an increased risk of all-causes mortality [10,11] as well as the occurrence of heart disease [12], diabetes [13,14], hypertension [13,15], obesity [13,15], and depression [1]. In one of the few population studies carried out in Brazil on this subject, Lima-Costa et al. (2008) found no association between sleep duration and hypertension [16]. Despite the importance of sleep for health, studies on sleep duration are scarce in Brazil and generally address sleep problems (such as insomnia) in groups of patients or the general population [17,18].

Considering the need to improve knowledge on this subject in Brazil, the aim of the present study was to assess the sleep patterns of the adult population in the city of Campinas (SP, Brazil) according to demographic, socioeconomic factors, and chronic diseases.

2. Methods

A population-based cross-sectional study involving 2637 adults (aged 18 years or older) living in urban areas of the city of Campinas (Brazil) was conducted in 2008 and 2009. The data came from

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the Campinas Health Survey (ISACAMP) carried out by the Department of Preventive and Social Medicine of the Medical Science School of the *Universidade Estadual de Campinas* (Brazil).

A probabilistic sample was obtained in two stages: census tracts and residences. In the first stage, 50 census tracts were selected with probability proportional to size (number of residences). The selection was systematic, with the sectors organized by the percentage of heads of household with a higher educational level, thereby producing implicit stratification. In the second stage, households were selected from the sampled census tracts.

Sample size was determined considering maximal variability for the frequency of the events studied ($P = 0.50$), a 95% confidence interval ($z = 1.96$), 4% and 5% point sampling errors, and a design effect of two, which determined 1000 individuals in each age group: adolescents (10–19 years), adults (20–59 years), and the elderly (60 or more years). Expecting coverage and response rates of 80%, the sample size was corrected to 1250. To reach this size in each age group, after updating the tract maps and drafting the list of addresses, 2150, 700, and 3900 residences were independently selected for adolescents, adults, and elderly individuals, respectively. In each household, all residents within the selected age group for the residence in question were interviewed.

Information on demographic, socioeconomic variables, and chronic diseases was obtained using a previously tested structured questionnaire administered in the patients' homes by trained, supervised interviewers. From the question "How long, on average, do you spend sleeping on a weekday and on a weekend day?" a weighted mean of hours and minutes of daily sleep was calculated, obtaining the sleep duration variable, which was categorized as: six or fewer hours, 7–8 h, and nine or more hours.

Sleep duration was analyzed with regard to the following:

Demographic and socioeconomic variables: gender, age (18–39, 40–59, 60 years or older), marital status (married/living together, divorced/separated, widowed, single), self-reported skin color/ethnic background (white, black/mixed), schooling (0–3, 4–7, 8–11, 12 or more years of study), per capita monthly household income (1 minimum salary or less, 1–3 times the minimal salary and 3 or more times the minimum salary), work status (working, not working, housewife), and number of household appliances (10 or fewer, more than 10).

Morbidity: self-reported chronic diseases and complaints of chronic symptoms (hypertension, diabetes, heart disease, cancer, rheumatism/arthritis/arthrosis, osteoporosis, respiratory problems, repetitive strain injury, cardiovascular problems, emotional problem/anxiety/depression, migraine/headache, back problems, allergy, and vertigo), number of chronic diseases (none, 1 or 2, 3 or more), and sleep quality (assessed by the question: "In the last 30 days, did you sleep badly?" and categorized as fine sleep [no] and poor sleep [yes]).

Physical activity during leisure time (sedentary, insufficiently active, and active), smoking (never smoked, ex-smoker, and smoker) and weekly frequency of alcohol intake (no intake, intake less than once a week, intake one or more times a week) were used to verify confounding among the associations, as such variables are associated with sleep duration [7].

The chi-square test was used to determine associations between sleep pattern and other variables, with the level of significance set at 5%. Multinomial logistic regression analysis was employed to estimate associations between sleep pattern and other variables. The multinomial logistic model is a generalization of the logistic model and has the same function of canonical connection (logistic function). Its use is appropriate when the response variable is categorical and polytomic, the categories of which are mutually exclusive and have no implicit order between them [19]. In this analysis, the patterns were simultaneously compared with the independent reference category (7–8 h of sleep). In the

multiple models, demographic and socioeconomic variables that achieved a p -value of less than 0.20 in the simple analysis were selected and only those with a p -value of less than 0.05 in the multiple logistic analysis remained in the model. Regression models were performed to determine the association between sleep duration and chronic disease and included the demographic and socioeconomic variables in the final model of the previous analyses. For all analyses, the sample design effect was considered by using the *svy* commands of the Stata 11.0 program, which consider weight factors and the complex design of the sample. The study received approval from the ethics committee of the Faculty of Medical Science of the *Universidade Estadual de Campinas*, Brazil (process n° 079/2007).

3. Results

A total of 2637 adults from the city of Campinas (Brazil) were interviewed (response rate = 85.6%). Mean age was 41.8 years (95% CI: 40.7–42.9). A total of 47.7% of the sample were male. For 17 individuals, the question on sleep duration was marked as "doesn't know or didn't answer," which was treated as missing data, resulting in a final sample of 2618 individuals. Mean sleep duration was eight hours and 15 min ($SE = 0.06$). A total of 21.9% of the respondents reported having the short sleep pattern (six or fewer hours), 62.3% reported having the medium sleep pattern (7–8 h), and 15.8% reported having the long sleep pattern (nine or more hours).

Sleep duration was not significantly associated with gender or ethnic background. For the remaining variables, the prevalence of the medium sleep pattern was higher among those between 40 and 59 years of age, those who were married or living with a partner, those who had more years of schooling and greater per capita monthly income, those who worked, and those who had a greater number of appliances in the home (Table 1).

Table 2 displays the results of the multivariate model showing the demographic and socioeconomic factors associated with sleep pattern. The prevalence of sleep for six or fewer hours increased with age and an increase in age led to a reduction in the chance of exhibiting the long sleep duration (nine or more hours). With regard to marital status, a higher percentage of separated or single individuals slept six hours or less in comparison to married individuals, whereas the prevalence of both the long and short sleep patterns was higher among single individuals in comparison to married ones. The prevalence of the long sleep duration decreased with the increase in schooling. With regard to work status, individuals who did not work or were housewives had a greater chance of exhibiting the long sleep pattern compared to those who worked.

Table 3 displays the data on health conditions adjusted for gender, age, marital status, schooling, and work status. Heart disease, vascular problems, rheumatism/arthritis/arthrosis, osteoporosis, and emotional problems had a U-shaped association with sleep duration, as the prevalence of both short and long sleep patterns was higher among individuals who reported these conditions. Back pain/problems were only related to the short sleep pattern. Hypertension, diabetes, migraine/headache, and allergies had no statistically significant association with sleep duration. Individuals with three or more health conditions had a greater chance of exhibiting the short sleep pattern in comparison to those with none of the conditions investigated. Individuals who reported poor sleep had a 6.31-fold greater chance of exhibiting the short sleep pattern in comparison to those who reported fine sleep.

The variables physical activity, smoking habits, and frequency of alcohol intake were included in another regression model. These results did not differ from the previously reported findings (data not shown in tables).

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