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Original Research Article

Association between Nighttime-Daytime Sleep Patterns and Chronic Diseases: A Community-Based Cross-Sectional Study

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Abstract

Background: The goal of this study was to see if there was a link between distinct nighttime-daytime sleep patterns and the frequency of various chronic diseases among the elderly.

Methods: A community-based cross-sectional research of 209 elderly people with an average age of 72.5±3.2 years was done. The study collected sleep-related characteristics (nighttime sleep duration, daytime napping, and its duration) as well as chronic illness status, such as diabetes, cardiovascular diseases (CVD), dyslipidemia, cancer, and arthritis.

Results: More than 80% of people had one or more chronic illnesses. The most common disease was cardiovascular disease (54.8%), followed by dyslipidemia (26.6%), diabetes (19%), arthritis (15.1%), and cancer (4.3 percent). The average nightly sleep duration and all-day-long total sleep duration for the overall study population were 6.65 h and 7.40 h, respectively, and the average daytime napping duration was 49.22 min, with 54 percent of the study subjects napping regularly.

Conclusion: Elderly people with chronic conditions exhibited varied night-day sleep patterns, and understanding these associations may help guide chronic disease management.

Keywords: Sleep pattern, Napping, Chronic diseases, Elderly

Introduction

Sleep physiology changes significantly during life, and sleep length distributions shift with age [1]. Sleep duration may also be affected by a variety of health issues that affect the elderly [1]. As a result, the elderly and middle-aged adults have different relationships with sleep duration and chronic disorders.

Though research outcomes have been inconsistent, sleep habits may be an essential indication of chronic diseases such as diabetes, hypertension, dyslipidemia, coronary heart disease, and cancer [2]. Previous research has focused on the all-day sleep duration, taking into account the distribution of overnight and daytime sleep [3]. Napping throughout the day is considered a beneficial lifestyle component, particularly in Latin America and the Mediterranean [4]. A chronic condition might affect or cause sleep disturbances. Understanding the link

between distinct sleep patterns and various chronic diseases has important implications for public health and chronic disease treatment. We present the results of a large community-based cross-sectional study in which we looked at the link between overnight and daytime sleep habits and chronic diseases in an older population.

Methods

A community-based cross-sectional study comprising 209 elderly patients above 65 years. Before beginning the study, all participants signed a written informed consent form. The study was carried out following the Declaration of Helsinki and was approved by the Ethical Review Committee of the Institution.

Face-to-face interviews were conducted with all participants by qualified interviewers. A validated structure questionnaire was used to collect information on demographic and anthropometric factors (e.g., age, gender, BMI), medical history (e.g., diabetes, dyslipidemia, cardiovascular diseases, cancer, and other chronic diseases), and lifestyle characteristics (e.g., physical activity, smoking, and drinking status).

The following questions were used to get self-reported sleep habits: "How long do you sleep on average at night?" "Do you nap during the day?" and "How long do you nap during the day on average?" Total sleep time was measured by combining nocturnal sleep hours with napping hours during the day (if no daytime napping, daytime napping duration equals 0). For data analysis, we first identified nighttime-daytime sleep patterns for the entire population based on overnight sleep duration plus habitual nappers versus non-nappers. Then, in regular nappers, we identified nighttime-daytime sleep length patterns based on nocturnal sleep duration and daytime napping duration.

Diabetes, CVD (including coronary heart disease, hypertension, and stroke), dyslipidemia (including hyperlipidemiaand non-alcoholic fatty liver), cancer (any form), and arthritis are all considered chronic disorders in this study. All study participants were required to fill out a medical history questionnaire and have a physical examination as well as routine blood and urine testing. Physicians' diagnoses were used to classify all chronic illnesses.

Statistical Analysis

Descriptive statistics such as mean, standard deviations (SD), and percentages were determined. The chi-square test for categorical variables and the Student t-test for continuous variables were used to examine differences in demographic features and potential chronic disease risk factors between sleep duration and sleep pattern groups. IBM SPSS version 22 was used for all statistical methods. The significance level for statistical testing was set at P 0.05.

Results

Table 1 displays the demographics of research participants based on nocturnal sleep, daytime napping, and total sleep for the entire day. A total of 209 elderly persons with an average age of 72.5±3.2 years took part in the study. CVD, followed by dyslipidemia, diabetes, arthritis, and cancer, has the highest prevalence of certain types of chronic diseases. The average nightly sleep duration and all-day-long total sleep duration for the overall study population were 6.65 h and 7.40 h, respectively, and the average daytime napping duration was 49.22 min, with 54 percent of the study subjects napping regularly.

The amount of sleep at night and napping throughout the day were both linked to age. Participants who slept during the day were older than non-nappers, and those who napped during the night were older than those who napped during the day. The prevalence of any chronic condition was found to be significantly greater among those who slept little at night and napped a

lot during the day, while there was no difference in the total sleep duration group.

We looked at nighttime-daytime sleep patterns based on overnight sleep duration with or without regular nappers or non-nappers because there was no significant difference between total sleep groups. Short overnight sleep with daytime napping [N 59 = (28.2%)]; Short nightly sleep without daytime napping [N 40 = (19.1%)]; Long nighttime sleep with daytime napping [N 64 = (30.6%)]; Long nighttime sleep without daytime napping [N 46= (22%). Sleep patterns at night and during the day were linked to age and smoking status. The people who had the "short overnight sleep with daytime napping" trend were slightly older. There was a link between nocturnal and daytime sleep patterns and the prevalence of chronic illnesses, cardiovascular disease, dyslipidemia, and arthritis. Participants who had "a lot of sleep at night without napping during the day" had the lowest rates of chronic conditions such as CVD, dyslipidemia, and arthritis. There were no variations in sleep patterns between diabetics and cancer patients.

Table 1: Characteristics of the population by total sleep, nighttime sleep, and napping

	Nighttime sleep		P-value	Daytime napping			P-value	Total sleep		P-value
	≤ 6.5 h	> 6.5 h		Non-nappers	≤ 45 min	> 45 min		≤ 7 h	> 7 h	
No. subjects (%)	95 (47.5)	105 (52.5)		96 (45.9)	73 (34.9)	40 (19.1)		114 (54.5)	95 (45.4)	
Age (years)	73.30 ± 6.80	73.65 ±7.16	0.004 *	73.31 ±7.04	74.40 ±7.15	74.26 ±6.77	0.001*	74.06 ±6.76	73.86 ±7.22	0.105
Smoking status (%)			0.001 *				0.365			0.001 *
Non-smoker	79 (83.1)	78 (74.3)		78 (81.2)	61 (83.6)	33 (82.5)		95 (83.3)	75 (78.9)	
Ex-smoker	6 (6.3)	21 (20)		10 (10.4)	5 (6.8)	3 (7.5)		11 (9.6)	10 (10.5)	
Current smoker	10 (10.5)	6 (5.7)		8 (8.3)	7 (9.6)	4 (10)		8 (7)	10 (10.5)	
Alcohol consumption (%)			0.575				0.424			0.368
None or < 1/month	81 (85.2)	90 (85.7)		85 (88.5)	64 (87.7)	36 (90)		100 (87.7)	83 (87.4)	
Past drinker (>1/month)	9 (9.5)	8 (7.6)		9 (9.4)	7 (9.6)	3 (7.5)		11(9.6)	9 (9.5)	
Current drinker (>1/month)	5 (5.3)	7 (6.7)		2 (2.1)	2 (2.7)	1 (2.5)		3 (2.6)	3 (3.1)	
Any of chronic diseases (%)	82 (86.3)	89 (84.8)	0.001 *	81 (84.4)	59 (80.8)	34 (85)	0.001*	97 (85.1)	78 (82.1)	0.077
Diabetes (%)	18 (18.9)	20 (19)	0.095	19 (19.8)	15 (20.5)	7 (17.5)	0.585	21 (18.4)	18 (18.9)	0.184
CVD (%)	51 (53.7)	56 (53.3)	0.085	50 (52)	41 (56.2)	23 (57.5)	0.007	62 (54.4)	54 (56.8)	0.355
Dyslipidemia (%)	26 (27.4)	27 (25.7)	0.065	25 (26)	19 (26)	11 (27.5)	0.365	31 (27.2)	25 (26.3)	0.348
Cancer (%)	5 (5.3)	3 (2.9)	0.125	4 (4.2)	3 (4.1)	2 (5)	0.347	5 (4.4)	4 (4.2)	0.508
Arthritis (%)	17 (17.8)	13 (12.4)	0.001 *	12 (12.5)	13 (17.8)	6 (15)	0.003*	19 (16.7)	13 (13.7)	0.002 *

Discussion

The current cross-sectional study looked at the prevalence of several chronic diseases based on sleep patterns and discovered some links between chronic diseases and nighttime-daytime sleep patterns. In our study population, 84.1 percent of people had one or more chronic conditions. The most common disease was cardiovascular disease (54.8%), followed by dyslipidemia (26.6%), diabetes (19%), arthritis (15.1%), and cancer (4.3 percent). We discovered that individuals who slept "long overnight

sleep without daytime napping" had a higher prevalence of diabetes and a lower prevalence of arthritis than those who slept "short night time sleep with midday napping."Those who slept "long at night and napped throughout the day" had a higher risk of diabetes and a decreased risk of cancer. When the habitual nappers were divided into groups based on nighttime-daytime duration patterns, those with "long night time sleep with short daytime napping" still had a higher prevalence of diabetes, while those with "short night time sleep with long daytime napping" had a lower prevalence of any chronic disease, cancer, and arthritis.

A U-shaped relationship between sleep duration and diabetes has been suggested in several cross-sectional and prospective studies [5,6], however one study showed no link [2]. The evidence for a link between sleep patterns and cancer was similarly contradictory. A meta-analysis of 13 cohorts found a positive link between extended sleep duration and colorectal cancer, but an inverse link with hormone-related malignancies, such as breast cancer [7]. Short sleep duration, defined as sleeping less than 6 hours each night, has been linked to cancer [8]. The findings for daytime napping were also mixed. When comparing habitual nappers to non-nappers, a meta-analysis of many prospective studies on the association between daytime napping and the risk of type 2 diabetes (T2D) discovered a 17 percent elevated risk of T2D [9].

However, no significant link was found between total sleep duration and any of the chronic diseases or specific chronic diseases in our study. Different nighttime-daytime sleep rhythms and nighttime-daytime sleep length patterns were found to have significant relationships. Furthermore, we discovered inverse relationships between nighttime-daytime sleep length patterns and diabetes and cancer prevalence. Diabetes is more vulnerable to the effects of eating habits and nutritional intake than cancer [10]. Short sleep duration (typically less than 6 hours per night) has been linked to obesity [11] and diabetes [6] in studies. Sleep restriction had detrimental effects on appetite-related hormones, which could further influence energy intake and weight, implying that the link between chronic metabolic abnormalities and chronic disease could be explained by specific sleep patterns [12]. Longer nightly sleep duration was found to have a protective impact against several cancers, particularly hormone-related cancers. Melatonin inhibited cell growth and angiogenesis [13]. Melatonin has been linked to malignancies of the breast, endometrial, ovary, prostate, and thyroid [14], as well as cancers of the endometrium, ovary, prostate, and thyroid [15]. Sleep duration is inversely proportional to melatonin levels [16]. As a result, longer sleepers may have higher melatonin levels, which may lower the risk of some malignancies.

Furthermore, several data on the link between sleep patterns and arthritis have been discovered. The pattern "long overnight sleep without daytime napping/short daytime napping" had a lower proportion of participants than those with short night time sleep with daytime napping/long daytime napping. Our findings may be in line with earlier studies on the relationship between arthritis and night time sleep length, which found that arthritis was linked to shorter nocturnal sleep [17].

The fact that sleep time was self-reported is one of the study's shortcomings. Self-reported sleep patterns are prone to reporting bias; hence objective sleep duration assessments are the best option. We also didn't include pain-related questions in our study is a serious flaw. We only had questions on arthritis in our questionnaire, and we decided that we should explore pain-related issues in future research. However, only a few researches have looked at sleep patterns, with the

majority focusing on sleep duration or quality [18]. Apart from the distribution of diverse sleep patterns, we also discovered significant connections between sleep patterns and various chronic diseases, which could indicate the need for precision chronic disease management. Night time sleep, daytime napping, total sleep, and the nighttime-daytime sleep pattern were the four components of sleep that we looked at [19].

Conclusion

In our research, we discovered that nighttime-daytime sleep patterns had a significant link with chronic diseases, particularly diabetes, cancer, and arthritis. Given the importance of daily sleep habits in one's health, more research is needed to better our understanding of this topic, particularly nighttime-daytime sleep patterns.

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