The Siesta and Mortality in the Elderly: Effect of Rest Without Sleep and Daytime Sleep Duration

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Study Objective: To examine the effects of daytime rest without sleep and duration of the siesta on mortality.
Design: Longitudinal observation.
Setting and Participants: Population sample of 442 community-dwelling 70-year-old subjects examined both at home and in a geriatric hospital.
Interventions: N/A
Measurements and Results: Overall mortality for those who neither rested nor slept was 9.3%, for those who rested without sleep 10.9%, and for those who slept 19%, p<0.02. Males had higher mortality (19%) than females (10%), p<0.006. Rest without sleep had no effect on mortality: in males, 13%, 21%, 18% for no rest, rest of less than one hour, or more than one hour with respective 8%, 6% and 4% in females. However, daytime sleep in males of more than one hour had 28.2% mortality, whereas sleep of one hour or less had 13.6% mortality, p=0.02. In females mortality rate was not different by sleep duration: 16% and 13.6% for those who slept for one hour or less, or more than one hour, respectively. In a multivariate analysis in females, a siesta of one hour or less was associated with risk odds ratio (ROR) of 4.67 and 95% confidence interval (CI) 1.22 - 17.80 and of one to two hours, ROR was 5.57 and 95% CI 1.05 – 29.49. For males, siesta of less than one hour was not associated with excess risk, ROR 0.9 and 95% CI 0.39 – 2.38; a siesta of one to two hours with ROR of 2.61 and 95% CI 1.01 – 6.80; and two hours or more ROR 13.6 and 95% CI 0.98 – 2.10.
Conclusions: Rest without sleep is not associated with excess risk of mortality. However, siesta of one to two hours is associated with increased mortality in males whereas, in women, a siesta of less than one hours confers the excess risk.

INTRODUCTION

WE RECENTLY REPORTED THAT IN THE JERUSALEM LONGITUDINAL 70-YEAR-OLDS-STUDY, DAYTIME SLEEP WAS PREDICTIVE OF VASCULAR AND TOTAL MORTALITY.[1] Daytime sleep was associated with mortality in two other studies in elderly subjects.[2,3] We hypothesized that as the morning elevation of heart rate and blood pressure is associated with cardiovascular events,[4-9] it is possible that similar changes after waking up in the afternoon[10-12] may be associated with increased cardiovascular load, hence the increased mortality. However, it was shown that the morning elevation of blood pressure and heart rate[13-16] (as well as platelets aggregability[9]) does not occur if the subject remains awake in bed in the morning.[17,18] We therefore attempted to examine the effects of resting in bed in the afternoon, as compared with sleeping (the siesta) to discern whether upright posture and physical activity is what matters. We also attempted to examine the relationship between daytime sleep duration and mortality. We examined males and females separately because both the siesta and mortality had higher incidence among males.[1]

Disclosure Statement
Nothing to Disclose.

Submitted for publication January 2001
Accepted for publication November 2001
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METHODS

Subjects

In 1990 and 1991 candidates were selected from a 40% systematic sample of residents of western Jerusalem born between 1920 and 1921, obtained from electoral records sorted by month of birth and polling booth location. Sampling methods and detailed protocols are described in full elsewhere.[19-21] In brief, a licensed nurse and social worker visited and interviewed the participants in their homes during that year. In the interim, in addition to a variety of questions regarding health and social status, they were asked: "Do you nap every day?" "What is the duration of your nap?" "Do you rest without napping every day?" "What is the duration of your rest?" The questions were not validated and there is no information whether this practice persisted. We use here the terms "rest" as that time spent in bed without sleep and "siesta" or "nap" as daytime sleep. On a different day the participants came fasting to a geriatric hospital where physical examination, ECG recording, and blood and urine testing were performed. Disease states were determined from a combination of history, physical examination (hemiplagia for cerebrovascular accident [CVA]), and the laboratory investigations such as ECG (for myocardial infarction [MI]), serum glucose (for diabetes), cholesterol and triglycerides (for hyperlipidemia), etc. Physically active subjects were those who reported at least four hours of weekly walking or other type of exercise. Four hundred and forty-two subjects were included from the total of 463 subjects, since 21 did not answer the questions about the siesta, including its duration or about rest. All subjects gave informed consent approved by the Human Experiments Committee of the Hebrew University-Hadassah University Hospitals, Jerusalem.

Table 1—Covariate correlation coefficients matrix with six years mortality by daytime rest, sleep, or neither

	No Daytime Rest or Sleep (n=75)	Daytime Rest (n=100)	Daytime Sleep (n=267)
Hypertension	-0.03	0.15	0.07
Diabetes mellitus	0.12	0.20	0.11
CVA	-0.06	0.2*	0.2**
MI	0.11	0.21*	0.05
Physical activity	-0.18	-0.19	-0.09***
Cancer	0.25*	0.09	0.08
Cholesterol level	-0.12	-0.08	-0.04
Triglycerides	0.05	-0.06	0.014

CVA denotes cerebrovascular disease; MI denotes myocardial infarction; *p<0.05; **p<0.008; ***p<0.002

Table 2—Prevalence of daytime sleep or rest with previous diseases

	Daytime Sleep (%)	Daytime Rest (%)
Hypertensives	59	23
Normotensives	61	22
Diabetics	62	21
Non-Diabetics	60	23
Cancer	47	23
No Cancer	61	23
Past MI	81*	11
No Past MI	58	24
Past CVA	47	27
No Past CVA	61	23

MI denotes myocardial infarction; CVA denotes cerebrovascular accidnet; *p=0.01

Mortality Data

Mortality data were received from the Ministry of the Interior registry coded according to the *International Classification of Diseases*, Ninth Revision, Clinical Modification,[22] and grouped as cancer-related (codes 140-239), total vascular (codes 390-438), or all other causes.

Statistics

Data were entered into a personal computer using a software data entry program (SAS FSP, SAS Institute, Cary, NC, USA) that includes logical checks on the magnitude of variables. Analysis was carried out using two SAS modules (SAS-BASE and SAS-STAT). The Student t-test was used to test for significant differences between groups where the variable of interest was continuous. Where the variables were discrete, two tests or the Fisher exact test (when expected cell size was <5 in a 2 x 2 table) was used. P<0.05 (two-tailed) was considered significant. Multiple logistic regression models were constructed for multivariate analyses.

RESULTS

Only 75 subjects (17%; 37 females, 38 males) neither rested nor napped. One hundred subjects rested in the afternoon without sleeping (59 females, 41 males), and the remaining 267 subjects (101 females, 166 males) slept in the afternoon. Mortality for those who neither rested nor napped was 9.3% and did not differ from those who rested without napping, 10.9%; however, mortality was 19% for those who napped, p for trend <0.02, Figure 1. The difference between those who slept one hour or more and those who only rested was significant (ROR 2.6, 95% CI 1.14-6.23), as it was with those who neither slept nor rested (ROR 3.68, 95% CI 1.36-9.92). Overall, males had a mortality of 19% whereas females of 10%, p=0.006. There was no significant difference in the six year mortality among those who did not rest or sleep 8.1% for females (n=37) and 13.2% for males (n=38) p=0.6. There was no significant difference in mortality rates between males (19.5%) and females (5.1%) who rested without sleeping, p=0.23. The siesta had 14.9% mortality among females (n=101) and 21.1% mortality among males (n=166), p=0.11. In Figure 2 six-year mortality is shown for the different levels of rest and the siesta by duration. It is evident that only among males was there increased mortality with the duration of the siesta (13.6% of those [n=81] who napped for less than one hour and 28.2% of those [n=85] who napped one hour or more p=0.02). Correlations of some clinical parameters and risk factors with mortality by daytime sleep, rest without sleep, or neither, are shown in Table 1.

In a multiple logistic regression model incorporating conventional risk factors, disease states such as hypertension, diabetes mellitus, past CVA, past MI, physical activity, cancer diagnosis, smoking status, and cholesterol and triglyceride levels. For males, duration of siesta was significantly predictive of mortality (p=0.0165), as was prior cerebrovascular event (ROR=5.26, 95% CI 1.21, 23.11), diabetes (ROR=2.47, 95% CI 1.05, 5.81), and lack of physical exercise (ROR=2.94, 95% CI 1.39, 6.25). Compared with the baseline cohort of persons who did not take a siesta, including those who rested during the day, mortality odds ratios were not significantly elevated for men who slept for less

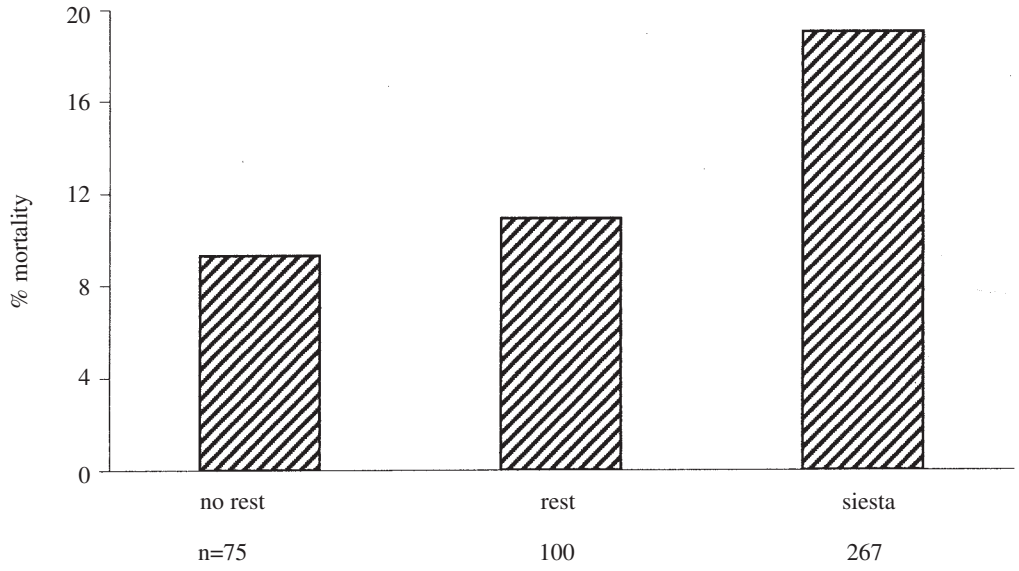

Figure 1—Six-year mortality according to neither rest nor sleep, daytime rest, daytime sleep (siesta). P for trend <0.02.

than one hour a day (ROR=0.90, 95% CI 0.34, 2.38), or those who slept for longer than two hours each day (ROR=13.6, 95% CI 0.88, 21.07). For those who slept one to two hours a day, mortality odds ratio, however, was significantly elevated (ROR 2.61, 95%CI 1.00, 6.81). When the men who slept for one hour or more were combined, ROR was 2.7, 95% CI 1.07, 6.84.

The addition of predictors, such as serum creatinine levels, self-reported health status score, general tiredness score, and duration of nocturnal sleep to the model for males, slightly reduced the predictive power of siesta duration with respect to mortality (p=0.046). Lack of physical exercise (ROR=2.54, 95% CI 1.04, 6.22), low serum triglycerides (p=0.005), high creatinine levels (p=0.001) and low self-reported health status (p=0.0003) were the only significant covariates.

For females, duration of the siesta as a continuous variable was not predictive (p=0.21) of mortality. Past MI was the only marginally predictive covariate of mortality (ROR=3.77, 95% CI 0.96, 1.49). However, when the duration of the siesta in women was categorized as less than one hour, or one to two hours (only one female napped two hours or more and did not die). ROR were 4.67, 95% CI 1.22 – 17.80, and 5.57, 95% CI 1.05 – 24.49, respectively. Other significant covariates were past MI (ROR 5.49, 95% CI 1.03 – 29.39) for the former, and diabetes mellitus (ROR 7.01, 95% CI 1.31 – 37.55) for the latter category. To explore the possibility that daytime sleep or rest is a marker of disease we examined their prevalence, as shown in Table 2. Only past MI, but not CVA, diabetes, hypertension, or cancer were associated with increased prevalence of daytime sleep.

DISCUSSION

In this study we found that daytime rest without actual daytime sleep (nap, or siesta) is not associated with excess mortality in either females or males. However, siesta was associated with nearly doubled mortality (Figure 1). We also found that the duration of daytime sleep (as a continuous variable) was significantly associated with mortality in males. In males, when categorized by siesta duration, less than one hour was not predictive, one to two hours was predictive of more than double mortality, and the ROR of the siesta of more than two hours markedly increased (but with marginally insignificant lower CI). In females, as a continuous variable, duration of the siesta was not significant because of an "N" shaped mortality. However, when categorized, both less than one hours of sleep and one to two hours were associated with marked, four to five fold, increased risk of mortality. The other mortality predictive covariates, lack of exercise, CVA and diabetes in males and diabetes and past MI in females, support our finding that most of the mortality was vascular mortality,[1] because of abrupt changes of blood pressure and heart rate increasing myocardial oxygen demand and brain vascular shear stress. Indeed, at least two other groups found that daytime sleepiness and napping[2,3] may be associated with excess mortality. The effect of sleep duration may also fit into such an explanation. It is well known that as people fall asleep there is a progressive withdrawal of sympathetic nervous system (SNS) activity, at least as recorded from the peroneal nerve.[23,24] Moreover, a recent population based case-control study (74% males), confirmed not only that daily siesta is associated with myocardial infarction, but also that duration of the siesta was longer in cases than in controls.[25]

It appears from Table 2 that past MI patients took the siesta more frequently. However, this was not the case for CVA or cancer patients. Because, among past MI patients the siesta was not correlated with increased mortality as it was in those who rested, it is not likely a reflection of the disease state. Even when important disease states and risk factors were taken into account in the multiple variate regression, the siesta was still significant. The siesta was not due to disrupted nocturnal sleep in our study because, as we found previously, it was actually associated with increased nocturnal sleep satisfaction.[1] The cause of the higher ROR of the siesta in women is not clear. One possible explanation may be that, because of the overall greater mortality risk of men,[26] the added risk may be less important. A similar situation was found regarding daytime sleepiness in the Cardiovascular

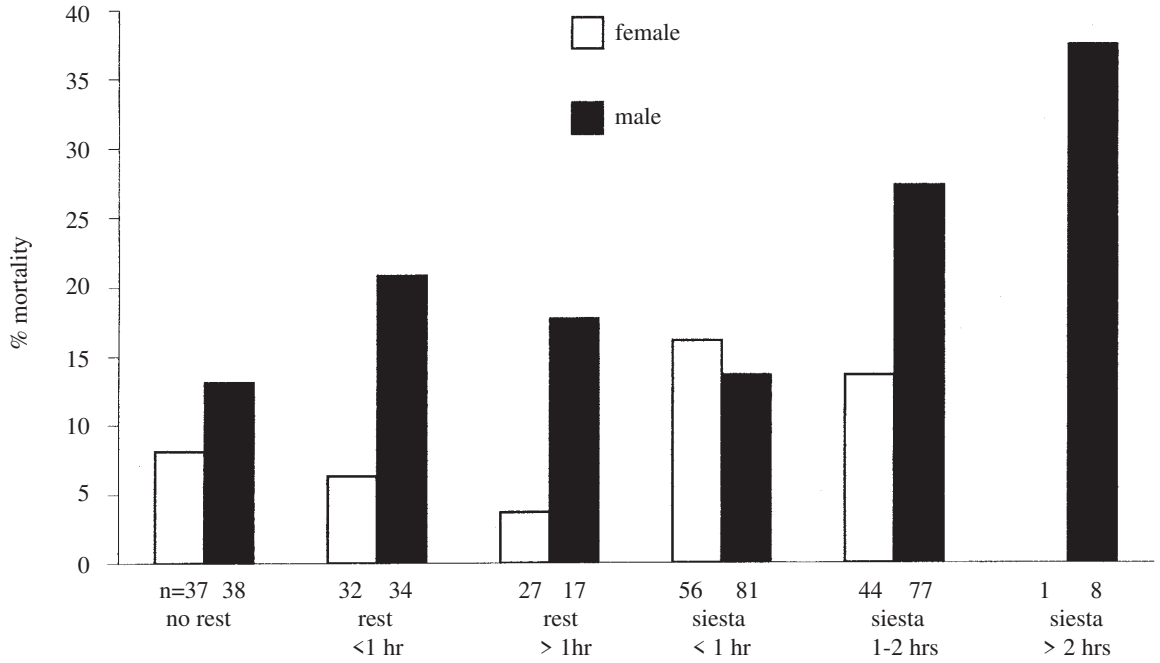

Figure 2—Six years mortality in males (full bars) and females (open bars) according to the presence of rest and its duration, daytime sleep (nap or siesta) and its duration. Males who slept over one hour had higher mortality than those who slept less than one hour, p=0.02.

Health Study.[27] The difference between the risk of shorter siesta in females and longer siesta in males is also not clear. We are not aware of gender differences in acquisition of SNS withdrawal during sleep but, if such differences exist, they are not well documented.

The data about the siesta, rest, or neither is self-reported and was not validated; however, it is unlikely that people would exaggerate their daytime sleeping habits. On the contrary, it is possible that some of those who reported rest were actually napping, diluting the effect on mortality. Also we have not collected information as to whether the siesta habit persisted during the six years of follow-up. Nevertheless, it is somewhat unlikely that older people would change a lifelong habit.[28]

In summary, we found that rest without sleep is not associated with excess risk. However, siesta of one hour or more is associated with substantial excess of risk in both genders. In women, also, a shorter siesta contributes to excess risk. These new observations conform to the findings of the morning clustering of cardiovascular events, but require further confirmation and better understanding before a time-honored practice such as the Mediterranean siesta is to be condemned.

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