The Siesta in the Elderly

Risk Factor for Mortality?

Michael Bursztyn, MD; Gary Ginsberg, DPH; Robert Hammerman-Rozenberg, MD; Jochanan Stessman, MD

Background: During the siesta, blood pressure declines like it does during night sleep. Because cardiovascular and cerebrovascular events cluster during the morning hours, when hemodynamic changes from nocturnal baseline are maximal, we hypothesized that an additional sleep period during the day (the siesta) may increase cardiovascular and cerebrovascular events, and thus mortality.

Methods: A prospective population-based cohort study of 455 70-year-old residents of Jerusalem, Israel, using self-reported siesta at baseline and 6 1/2 years of total mortality data.

Results: The prevalence of the practice of the siesta was 60.7%. It was more prevalent among men than women (68% vs 51%, P < .001) and in survivors of previous myocardial infarction than in those without previous myocardial infarction (78% vs 58%, P = .009). After 6 1/2 years of follow-up (1990-1996), 75 subjects died. For those who practiced the siesta, total mortality was 20% vs 11% for those who did not (P = .01; risk odds ratio, 2.0; 95% confidence interval, 1.1-3.4). In a multiple logistic regression model that included several lifestyle descriptors, risk factors, and diseases, the siesta remained predictive of mortality (P = .03; risk odds ratio, 2.1; 95% confidence interval, 1.1-3.9).

Conclusions: The siesta seems to be an independent predictor of mortality. It is still unknown whether this association is causal.

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Ancecumulated evidence suggests that cardiovascular events, such as stroke1,2 and myocardial infarction,3-5 are clustered around the morning waking hours. During these hours, a multitude of changes are triggered by humoral factors, such as plasma catecholamines, renin activity, and plasma plasminogen activator inhibitor. These changes contribute to the thrombogenic potential, which includes increased platelet aggregability.6 Concomitantly, there are also remarkable hemodynamic changes, prominent among them a short-term blood pressure and heart rate increase,7-10 probably triggered by central activation of the sympathetic nervous system.11,12 Because heart rate, systolic blood pressure, and their double product (systolic blood pressure × heart rate) are major determinants of cardiac oxygen consumption and vascular stress, they may be regarded as important contributors to the sympathetically mediated morning hours’ clustering of cardiovascular events.

Afternoon sleep, or siesta, is a common practice, particularly in many Mediterranean and Latin American countries. Some epidemiological evidence from Greece suggests that the siesta may have a protective effect on cardiovascular events.13,14 Although the effect of the siesta on blood pressure has been known for more than a decade,12 it has received little attention in the literature. This oversight is surprising in view of a recent finding that indicates a decline in blood pressure during the siesta comparable with that occurring during night sleep.15 The similarity in the cardiovascular response to night and midday sleep raises the possibility of an additional postsiesta phenomenon16 parallel to that of the early morning abrupt increase of blood pressure and heart rate, resulting in a second period of increased cardiovascular risk.16

In a previous investigation17 of 24 hours’ ambulatory blood pressure monitoring, it was found that morning awakening is associated with marked increase of heart rate and blood pressure, while, on arising from the siesta, the rise in blood
SUBJECTS AND METHODS

SUBJECTS

In 1990 and 1991, candidates were selected from a 40% systematic sample of residents of western Jerusalem born between 1920 and 1921, as obtained from electoral records sorted by month of birth and polling booth location. Sampling methods and detailed protocols are described in full elsewhere.18-21 Four hundred fifty-five subjects were included from the total of 463 subjects, since 8 did not answer the question about the siesta. All subjects gave informed consent approved by the Human Experiments Committee of the Hebrew University–Hadassah University hospitals, Jerusalem.

MORTALITY DATA

Mortality data were received from the Ministry of 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.

RESULTS

Table 1. Characteristics of 70-Year-Old Subjects Who Practice the Siesta*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Siesta (n = 276)</th>
<th>No Siesta (n = 179)</th>
</tr>
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<tbody>
<tr>
<td>Female-male ratio</td>
<td>106 (38.4):170 (61.6)†</td>
<td>100 (55.9): 79 (44.1)</td>
</tr>
<tr>
<td>Died</td>
<td>55 (19.9)‡</td>
<td>20 (11.2)</td>
</tr>
<tr>
<td>Body mass index, mean ± SD§</td>
<td>27.0 ± 4.0</td>
<td>27.3 ± 4.0</td>
</tr>
<tr>
<td>Hypertension</td>
<td>152 (55.1)</td>
<td>104 (58.1)</td>
</tr>
<tr>
<td>Treated hypertension</td>
<td>116 (42.0)</td>
<td>80 (44.6)</td>
</tr>
<tr>
<td>Blood pressure, mean ± SD, mm Hg</td>
<td>141.5 ± 21.1</td>
<td>144.5 ± 19.9</td>
</tr>
<tr>
<td>Systolic</td>
<td>84.0 ± 10.6</td>
<td>85.0 ± 9.8</td>
</tr>
<tr>
<td>Diastolic</td>
<td>73 (26.4)</td>
<td>47 (26.3)</td>
</tr>
<tr>
<td>Ischemic heart disease</td>
<td>40 (14.5)‡</td>
<td>11 (6.1)</td>
</tr>
<tr>
<td>Past myocardial infarction</td>
<td>44 (16.0)</td>
<td>26 (14.5)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>6 (2.2)</td>
<td>14 (7.8)</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>8 (2.9)</td>
<td>9 (5.0)</td>
</tr>
<tr>
<td>Cancer</td>
<td>148 (53.6)</td>
<td>93 (50.0)</td>
</tr>
<tr>
<td>Physical activity¶</td>
<td>38 (13.8)</td>
<td>23 (12.9)</td>
</tr>
<tr>
<td>Smoking</td>
<td>5.9 ± 1.1 (228 ± 42)</td>
<td>6.1 ± 1.2 (236 ± 46)</td>
</tr>
<tr>
<td>Cholesterol level, mean ± SD, mmol/L (mg/dL)</td>
<td>1.6 ± 0.8 (142 ± 71)</td>
<td>1.6 ± 0.9 (142 ± 80)</td>
</tr>
<tr>
<td>Creatinine level, mean ± SD, µmol/L (mg/dL)</td>
<td>98.9 ± 34.0 (1.1 ± 0.4)</td>
<td>89.7 ± 22.3 (1.0 ± 0.3)</td>
</tr>
</tbody>
</table>

*Values are given as the number (percentage) of subjects, unless otherwise specified.
†P < .001.
‡P < .02.
§Calculated as the weight in kilograms divided by the square of height in meters.
P < .006.
¶Duration of 4 hours a week or more.

Two hundred seventy-six subjects reported taking a siesta (60.7% of the study participants). Their clinical characteristics are shown in Table 1. This practice was more common among the 249 men, 68.3% of whom reported the siesta, than the 206 women, of whom 51.5% reported this practice (P < .001). The siesta was also significantly more common among subjects reporting a previous myocardial infarction. Among those who had experienced an infarct, 78.4% took a siesta, while only 58.4% of those without this diagnosis did (P = .04). There was no association between the siesta and the other variables considered in the study.
between unspecified heart disease, cerebrovascular disease, diabetes mellitus, or hypertension and the siesta (Table 1). During the 6½ years of follow-up, there were 75 deaths among the 455 participants (16.5%). Deaths were classified as 44% vascular (31% cardiac and 13% cerebrovascular); 33%, cancer; and 23%, other causes. Mortality among the group that took a siesta was more common than among the group that did not take a siesta (19.9% vs 11.2%, P = .01). The risk odds ratio (ROR) was 2.0, and the 95% confidence interval (CI) was 1.1 to 3.4. In Table 2, mortality by the practice of the siesta in different clinical and demographic groups is shown. In the subjects without a prior infarct (n = 415), there was a significant doubling of the mortality (ROR, 2.0; 95% CI, 1.1-3.7).

Because the association with a previous myocardial infarction may affect subsequent mortality, we first analyzed the mortality data accounting for the association of napping and prior infarct. In a logistic regression analysis controlling just for the presence or absence of a previous myocardial infarction, we found that the practice of the siesta was associated with excess mortality, independent of past myocardial infarction history (P = .05; ROR, 1.78; 95% CI, 1.0-3.2). Furthermore, the siesta was associated with increased mortality even after accepted risk factors and disease states were taken into account. A multiple logistic regression model incorporating sex, systolic blood pressure, smoking status, cholesterol level, diabetes mellitus, physical exercise level, nocturnal sleep duration, cerebrovascular disease, previous myocardial infarction, and subjective financial hardship as covariates found that people who took the siesta had a significantly (P = .03) greater risk of dying in the 6½ postsur-ey years (ROR, 2.1; 95% CI, 1.1-3.8).

To account for the possibility that people who have had a myocardial infarction nap because they are sick and tired and, therefore, are at an increased risk of death, we added general tiredness and self-reported health status to the covariates listed in the previous model. Again, the siesta was found to be associated with an increased risk of death (ROR, 2.1; 95% CI, 1.1-3.9). Overall, the RORs of the siesta are significantly associated with mortality even in the absence of many diseases and risk factors, and the RORs are consistent (Table 2).

To examine the possibility that the siesta compensated for poor quality of night sleep, we analyzed the relationship between sleep satisfaction (not satisfied, usually satisfied, always satisfied) and napping. Among siestaakers, only 20% were not satisfied with night sleep vs 32% of those not taking a siesta; 57.8% of the siestaakers were always satisfied with sleep, while only 45.8% of those not taking a siesta were satisfied (P<.001). Moreover, there was a significant correlation (Mantel-Haenszel x² test for linear association, P = .003) between the practice of the siesta and greater nocturnal sleep satisfaction.

The causes of death in our cohort are shown in Table 3. There was a significantly greater frequency of death from total vascular (P = .04) and other (nonvascular and noncancerous) causes of death (P = .03). When more specific causes of death were considered in logistic regression models, none was related to the siesta or the other risk factors studied. With the exception of the protective effect of physical activity (P = .04) on death due to cardiac disease, no other common predictors of mortality demonstrated a significant association. The lack of significance, however, may reflect the few deaths in the specific categories. However, because death certificates are notoriously inaccurate in depicting cause of death, we find total mortality a preferable variable.

The principle finding of this study is the association, independent of the presence of known risk factors or dis-

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>Siesta (n = 276)</th>
<th>No Siesta (n = 179)</th>
<th>ROR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>14</td>
<td>10</td>
<td>0.90 (0.39-2.08)</td>
</tr>
<tr>
<td>Total vascular</td>
<td>25</td>
<td>7</td>
<td>2.46 (1.03-5.79)</td>
</tr>
<tr>
<td>Other</td>
<td>16</td>
<td>3</td>
<td>3.61 (1.04-12.58)</td>
</tr>
</tbody>
</table>

* ROR indicates risk odds ratio; CI, confidence interval.

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euse of the siesta with total mortality in a representative sample of an entire age stratum (70 years) of Jerusalem residents. This outcome is surprising. The siesta is a time-honored Mediterranean practice and naturally regarded as beneficial. Indeed, there is some evidence from a case-control study, in Greece that the duration of the siesta may have a borderline protective effect on cardiovascular events. On the other hand, clinical research in normal volunteers found that waking after the siesta results in “snooze-induced excitation sympathetic–triggered activity.” Our finding of an increase in the heart rate, blood pressure, and their double product on waking in the morning and afternoon confirms this depiction. Our finding that patients who practice the siesta were more likely to have had a diagnosis of myocardial infarction supports this hypothesis. The morning clustering of cardiovascular events may be related to hemodynamic and thrombogenic factors triggered by sympathetic activity surge and such a surge may also occur in the afternoon. Although there is no direct evidence of this surge, it is likely in view of the heart rate and blood pressure effects, a polysomnographic study in the elderly, and the role of a circadian pacemaker.

It may well be, however, that the afternoon sleep reflects a physician’s or self-imposed prescription for “rest” as seen in the association with previous myocardial infarction in our subjects. Such presumably more fragile individuals may be more likely to die. Our findings show that even when concomitant diagnoses, such as past myocardial infarction, cerebrovascular accident, and a multitude of other cardiovascular risk factors, are accounted for, the siesta correlates with mortality. Moreover, when participants’ scoring of general tiredness, as well as their self-reported health status, were incorporated in the model, the siesta remained predictive. Furthermore, in a 24-hour polysomnographic study of nocturnal sleep in the elderly, daytime sleep, mostly a long-standing habit, did not disrupt sleep at night. In normal, and younger, volunteers, there is evidence of an inherent tendency to fall asleep in the midafternoon, so it does not necessarily reflect a disease state. In this, as in a previous report from our cohort examining sleep satisfaction, it was found that our 70-year-old subjects who napped reported less fatigue and undiminished satisfaction with night sleep. What is the likelihood that the people who take the siesta have obstructive sleep apnea (hence their need for an afternoon nap, as well as increased cardiovascular risk)? Although we did not directly assess for obstructive sleep apnea, there are several observations in our cohort not consistent with this possibility. Those who practiced the siesta reported increased (not diminished) nocturnal sleep satisfaction. The body mass indexes (BMI or Quetelet in meters) of those who did and those who did not practice the siesta were similar, whereas obstructive sleep apnea is frequently associated with obesity. Snoring, a marker of sleep apnea, was not associated with mortality in our cohort (Table 2).

What is the meaning of the increased creatinine level in siesta takers (Table 1)? We believe it reflects more coronary atherosclerosis, as does the increased frequency of past myocardial infarction, because more extensive coronary disease is more likely to be associated with renal vascular atherosclerosis, a common cause of renal failure in the elderly. Nonetheless, there was no renal-related mortality in our study, and the relations of the siesta and mortality go beyond many disease states (Table 2) and remained significant in multiple logistic regression models incorporating as covariates many concomitant disease states and common risk factors.

Recently, Hays et al reported that excessive daytime sleepiness may also be associated with increased mortality. There are several important differences between their study and ours. First, they examined an age heterogeneous cohort, 37.4% of who were older than 75 years. Their subjects had a high level of cognitive impairment, whereas our population was essentially free of dementia. Moreover, their question about napping was formulated as, “How often do you get so sleepy during the day or evening that you have to take a nap?” This phrasing portrays a cultural difference that judges daytime sleep to be a phenomenon toward which the individual is driven by weakness. In addition, in that study, there was a strong association with night sleep complaints and more limited physical activity, in marked contrast to the findings in the present investigation. Thus, this study examined a different phenomenon in a different population and did not take into account medical history and findings. Their finding that mortality was greatest in the most cognitively impaired nappers also raises the issue of concomitant medical morbidity. In a preliminary report from the Cardiovascular Health Study, Newman et al found daytime sleepiness to be predictive of an adverse outcome. However, these subjects had obvious poorer health to begin with. Nonetheless, the findings of Hays et al and Newman et al are also consistent with our hypothesis that an additional sleeping period may confer another risk for mortality in elderly subjects.

Our study has several limitations. The cohort is small, taking a siesta is self-reported, the frequency of siesta is not known, and the precise causality of the association cannot be determined. However, those who answered positively to the question about afternoon sleep acknowledged doing it regularly. It is possible that some subjects who answered this question negatively actually do occasionally practice the siesta on weekends, introducing a dilution bias actual underestimating the effect of the siesta on vascular and non–cancer-related mortality. This cohort, despite its small size, was sufficient to establish the siesta as an independent, consistent (in multiple models) predictor of mortality. In these models, other clinical and behavioral predictors responded as expected. Moreover, the age and homogeneity, although limiting generalization, of results enhances the significance of these findings for this cohort.

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Reprints: Michael Bursztyn, MD, Hypertension Unit, Department of Medicine, Hadassah University Hospital, Mount Scopus, PO Box 24035, Jerusalem 91240, Israel (e-mail: bursz@cc.huji.ac.il).

REFERENCES