INSOMNIA

Sleep Hygiene Practices in a Population-Based Sample of Insomniacs

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Study Objectives: The present study was designed to assess selected aspects of sleep hygiene from a population-based sample of individuals with insomnia compared to age- and sex-matched controls.

Design: A random-sample phone survey of 258 individuals meeting Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition-based criteria for insomnia was compared to age- and sex-matched normal sleepers on specific measures of sleep hygiene. Sleep hygiene practices measured included cigarette smoking, smoking near bedtime, alcohol use, caffeine use, napping, time in bed, and reported likelihood of sleeping in on weekends.

Setting: Detroit tricounty population.

Participants: 258 individuals 18 to 65 years old with insomnia and 258 age- and sex-matched controls.

Interventions: N/A.

INTRODUCTION

INSOMNIA IS AMONG THE MOST PREVALENT SYMPTOMS ASSOCIATED WITH SLEEP-WAKE DYSFUNCTION, AFFECTING MORE THAN 10% OF THE GENERAL POPULATION.1 Studies have shown that insomnia can have a significant negative impact on an individual’s work, physical, and social performance, as well as overall quality of life.2,3 The economic costs of insomnia have been estimated to be more than $77 billion per year;4,5 this is likely due in part to the chronic nature of the disorder. Severe insomnia has been shown to last for a median of 4 years,6 with 44% of insomniacs continuing to report severe sleep disturbance ten years later.7

There has been debate over the efficacy of sleep hygiene for the treatment of chronic insomnia. The efficacy of sleep hygiene as a therapy is contingent upon poor basal sleep hygiene. There are few representative community-based data evaluating specific sleep hygiene practices in individuals with insomnia. Thus, within the multiple components of sleep hygiene, it is not known which, if any, specific behaviors should be targeted in insomnia treatment programs.

Sleep hygiene involves behavioral practices based on our understanding of sleep physiology and pharmacology, which have been identified to promote good sleep. First introduced by Peter Hauri8 in 1977, sleep hygiene has become a common tool of clinicians in the treatment of insomnia. Most insomnia treatment programs have incorporated sleep hygiene as 1 facet of a multicomponent approach.9 There have been several studies that have tested the effectiveness of general sleep hygiene practices as a single component in comparison to other specific sleep treatments; however, these studies have produced inconsistent results.

One study evaluated meditation, stimulus control, and sleep hygiene treatments for sleep-maintenance insomnia. They found that sleep hygiene was effective, as were the other treatments, although this study had no control group for comparison.10 Harvey et al used a cognitive behavioral treatment intervention over 6 sessions. These sessions included information on sleep education, sleep hygiene, stimulus control, and sleep restriction.11 The results showed that sleep scheduling and cognitive restructuring methods were more likely to produce significant improvements in sleep latency and nighttime wakefulness than was a combination of broad education techniques such as sleep hygiene, relaxation, or thought-blocking methods. However, the study did not examine sleep hygiene as a single component.

Another study surveyed university students using the Sleep Hygiene Awareness and Practice Scale and the Pittsburg Sleep Quality Index and showed that the practice of proper sleep habits was related positively to good sleep quality.12 Thus, although sleep hygiene as a single component has produced mixed results, there are some data to indicate a relationship between sleep hygiene and sleep quality in normal sleepers. The question remains as to whether specific aspects of sleep hygiene are differentially

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practiced in insomniacs relative to noninsomniacs. If differences are identified, they may help explain some of the discrepant findings related to sleep hygiene as an independent component in the behavioral treatment of insomnia. The current study was designed to assess selected aspects of sleep hygiene practices in a population-based sample of insomniacs and age- and sex-matched controls in order to determine if specific practices are encountered more frequently in insomniacs than in controls. The sleep hygiene practices assayed were only those related to commonly used substances and sleep habits, as these components are frequently engaged-in behaviors and often cited as potential targets for sleep hygiene targets.13

METHODS

A representative sample of 516 individuals was selected from the Detroit tricounty population based on answers provided during a 20-minute phone interview. Subjects were paid 25 dollars for participation. The protocol was approved by the institutional review board of Henry Ford Hospital. Individuals participating in this study were assessed in conjunction with a larger ongoing epidemiologic study investigating the prevalence of daytime sleepiness. Participants were drawn from the general population of tricounty metropolitan Detroit using random-digit dialing techniques. For eligibility, the calling address had to be a residence, and the participant an adult between the ages of 18 and 65 years. A random-probability selection procedure was used to determine the sex of the target adult. If 2 or 3 adults within a target sex were present in a household, random-probability selection procedure (oldest/second, oldest/youngest) was used to determine the treatment respondent. If 4 or more adults with the target sex were present in the household, last birthday method was used to determine the target respondent. In order to maintain an unbiased sample, only individuals who couldn’t answer the questionnaire due to sensory or mental impairment were excluded from the sample. From 4,682 eligible participants, 3,283 interviews were obtained (response rate 70.1%). The demographic details of the sample, including race status, is shown in Table 1 and are nearly identical to the 2000 Census data for the area.

Criteria for insomnia included a response of sometimes or of-
In that highly relevant targets for sleep hygiene in the insomnia population are considered important aspects of sleep hygiene, in so far as frequent naps may decrease the homeostatic sleep need. As a result, treatment programs routinely include this as a sleep hygiene variable. Treatment programs routinely include this as a sleep hygiene target but do not quantify its effect or patient adherence to specific behaviors. Previous studies have explored the relationship between nicotine and sleep. One population-based study found a relationship between cigarette smoking, difficulty initiating sleep, and symptoms associated with sleep fragmentation. Another study showed similar results; smokers were significantly more likely to report difficulty sleeping. In that study, smokers also reported a high daily caffeine intake, suggesting an inclination for individuals who engage in one unhealthy sleep behavior to also engage in others. This raises the question as to whether these behaviors are specific disturbers of sleep or simply reflective of a cognitive lifestyle that might be associated with insomnia. A study on smokers and age, ethnicity, and sex-matched nonsmokers, recorded information on cigarette, alcohol, and caffeine intake, as well as daily stress and sleep quality. The results showed that smokers were more likely to report poor sleep and use more alcohol than were nonsmokers. Results from the present study are consistent with these data, as we found that insomniacs smoke more often and closer to bedtime than controls.

The negative effect of alcohol on sleep and the use of alcohol to self-medicate in insomniacs have been extensively studied. Johnson et al found that 13% of the general population use alcohol to promote sleep. Of these individuals, those with difficulty falling asleep were more likely to use alcohol in order to improve sleep. Approximately 30% of insomniacs self-medicate with alcohol or over-the-counter medications. Furthermore, insomniacs who use alcohol have greater levels of daytime sleepiness than do insomniacs who do not use alcohol. The present study showed that 13% of insomniacs consume their last alcoholic beverage within 30 minutes of bedtime. It has been shown that tolerance to the sleep-inducing effects of alcohol develops within several nights. Consequently, individuals who use alcohol to promote sleep not only increase their social use, but also increase their intake after several nights of exposure. In the present study, insomniacs reported an average frequency of alcohol use of 5 days per week in comparison to 2 days per week in controls. These lines of evidence suggest the possibility that individuals with insomnia who self-medicate with alcohol may be at a higher risk for the development of alcohol dependence, but further research in this area is clearly needed before such a conclusion can be made.

Since caffeine has been known to disturb sleep, we chose to evaluate its use as a component of sleep hygiene. Although caffeine consumption was found to be slightly increased for the insomnia group compared to controls, the difference was not statistically significant. While the present data do not provide support for caffeine consumption as a target for treatment, we did not specifically differentiate the time of caffeine consumption. Thus, it is difficult to make a definitive conclusion in this regard. It is possible that insomniacs consume caffeine in the morning in response to poor sleep the previous night. In contrast, because caffeine is widely used and known to adversely affect sleep, perhaps insomniacs deliberately avoid such substances. Finally, individuals with insomnia may not consume more caffeine, but they may be more sensitive to it than are other people. These questions need to be addressed in future studies.

Daytime napping has also been associated with poor sleep hygiene, in so far as frequent naps may decrease the homeostatic drive for nocturnal sleep. Generally, it has been accepted that sleep need is approximately 8 hours per 24-hour period. As a result, it is important to emphasize that while previous studies have demonstrated the disruptive sleep effects of some of the poor sleeping practices assessed in the present study (e.g., caffeine consumption) the data do not provide information regarding causality. Although, these data provide useful information regarding the population prevalence of these behaviors in insomniacs and matched controls, the direction of any potential causality also remains unknown. For example, the current data do not inform whether a reduction in smoking prior to bedtime would improve sleep or potentially disrupt sleep due to possible nicotine withdrawal effects close to sleep onset. While the behaviors assessed are considered important aspects of sleep hygiene, continued research is necessary to test the potential therapeutic effects of alterations in each of these specific sleep hygiene components. What the present data do suggest is that there are diverse and highly relevant targets for sleep hygiene in the insomnia population. There have been few studies that include smoking as a specific sleep hygiene variable. There have been few studies that include smoking as a specific sleep hygiene variable.

<table>
<thead>
<tr>
<th>Sleep Hygiene Variable</th>
<th>Insomniac</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total sleep time, h</td>
<td>5.9 ± 1.7***</td>
<td>6.9 ± 1.2</td>
</tr>
<tr>
<td>Time in bed, h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekdays</td>
<td>7.3 ± 1.9</td>
<td>7.4 ± 1.2</td>
</tr>
<tr>
<td>Weekends</td>
<td>7.8 ± 2.0</td>
<td>8.03 ± 1.4</td>
</tr>
<tr>
<td>Sleep efficiency, %</td>
<td>79.9***</td>
<td>90.8</td>
</tr>
<tr>
<td>“Sleeping in,” %</td>
<td>42.7*</td>
<td>32.4</td>
</tr>
<tr>
<td>Naps, no./wk</td>
<td>3.5 ± 4.5*</td>
<td>2.7 ± 3.5</td>
</tr>
<tr>
<td>Regular smokers, %</td>
<td>40.7***</td>
<td>22.9</td>
</tr>
<tr>
<td>Smoke within 5 minutes of bedtime (regular smokers), %</td>
<td>45.3**</td>
<td>21.8</td>
</tr>
<tr>
<td>Alcoholic beverages, no./wk</td>
<td><strong>4.7 ± 11.0</strong></td>
<td>2.3 ± 4.8</td>
</tr>
<tr>
<td>Use alcohol to sleep, %</td>
<td>***29.1</td>
<td>11.2</td>
</tr>
<tr>
<td>Alcohol within 30 minutes of bedtime (regular drinkers), %</td>
<td>*12.9</td>
<td>5.6</td>
</tr>
<tr>
<td>Caffeine, no./d</td>
<td>3.0 ± 4.0</td>
<td>2.7± 3.3</td>
</tr>
</tbody>
</table>

Results are presented as mean ± SD for each variable in insomniacs and controls. See text for definition of “regular” smokers and “regular” drinkers.

*P < .05 **P < .01 ***P < .001
sult, any sleep accumulated during the day may decrease an individual’s sleep drive at night, thereby producing sleep disturbance. The present data, demonstrating a greater frequency of naps per week in insomniacs, are consistent with this notion. However, it must be recognized that polysonmographic data on the napping behavior of insomniacs are sparse and inconsistent. Because the majority of literature regarding napping is based on the sleep of normal individuals, controlled studies are needed to more systematically understand the potential impact of daytime naps on nocturnal sleep in individuals with insomnia.

While individuals with insomnia in our study report less total sleep time on both weekdays and weekends, there was no difference in nightly time in bed compared to controls. Interestingly, insomniacs report more frequently sleeping in on nonwork days. Sleep efficiency was lower in the insomniacs than in control participants. Sleep efficiency in our data is consistent with previous findings commonly of < 80% in both self-reported and polysonmographic data. One might speculate that such excess time in bed may contribute to elevated arousal associated with the bedroom environment, as has been suggested by previous investigators.

This possibility is also supported by studies showing that sleep restriction therapy, where time in bed is reduced to approximate habitual total sleep time and then slowly extended as sleep efficiency improves, is an effective treatment for improving sleep in patients with insomnia.

There were several limitations to this study that should be acknowledged. Because this was a population-based sample, clinical evaluations were not used to assess insomnia; thus, our results may not generalize to clinical populations. However, the criteria employed for identifying insomniacs in the current study was based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition and included a standardized and conservative measure of severity over the past 3 months. Therefore, the current sample is not likely to be biased in the direction of milder insomnia. In addition, the prevalence of insomnia using this criterion is consistent with other population-based studies. Caffeine use was measured only by the number of caffeinated beverages consumed and, as noted, was not assessed relative to time of day or other types of caffeine consumption. Our sample included persons with secondary as well as primary insomnia, and future studies may benefit by differentiating these subgroups. Both alcohol and smoking patterns can vary depending on psychological make-up; however, specific psychiatric profiles were not assessed in our interview. Therefore, we are unable to make any statements regarding the interaction between psychological disposition and specific sleep hygiene practices. As this is not a longitudinal study, we are unable to determine where in the evolutionary process of chronic insomnia these practices began. Another important limitation of the present study is that only selected aspects of sleep hygiene practices were evaluated. The present research focused on pharmacologic challenges to sleep and sleep habits. Other important aspects of sleep hygiene practices such as sleep environment (eg, noise, temperature, mattress), as well as daytime activities impacting sleep (exercise, bathing, wind down period, presleep eating), were not evaluated. Clearly, these have been shown to be important and warrant further research.

According to Spielman’s model of insomnia, predisposing, precipitating, and perpetuating factors all play a role in the manifestation of the disorder. The current results illustrate the potential importance of sleep hygiene as a component of this model. Future studies will need to determine where inappropriate sleep hygiene fits within the purposed multifactorial model of insomnia. Specifically, many individuals may unknowingly utilize inappropriate sleep practices for the purpose of minimizing sleep disturbance. For example, a person may smoke or have a drink just prior to bedtime in order to relax and hence to facilitate sleep. Though some individuals may believe these behaviors improve sleep, they are likely to prolong sleep latency and exacerbate sleep disturbance over time.

Previous studies have shown that individuals will often engage in multiple unhealthy behaviors. In the multivariate analysis, naps per week were not a significant predictor, suggesting that other sleep hygiene behaviors covary with daytime nap frequency. Indeed, a posthoc correlation matrix using all of the sleep hygiene parameters measured shows that napping is closely associated with sleeping-in on weekends (r = .14, P < .005). Similarly, the fact that drinks per week were no longer a significant predictor of insomnia in the multivariate model suggests that the differences found (increased drinks per week in insomniacs) is likely mediated by alcohol use specific to sleep near bedtime.

In conclusion, this population-based study demonstrated that insomniacs exhibit poor sleep behaviors. Insomniacs are more likely to smoke and drink alcohol and do so close to bedtime. Furthermore, they are also more likely to “sleep in,” possibly in an attempt to compensate for their disturbed sleep at night. Finally, while some insomniacs may engage in these activities with the aim of improving their sleep, such behaviors may be exacerbating or perpetuating their sleep disturbance.

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REFERENCES

Appendix

1) Overall cigarette smoking: “during the 12 months, did you ever smoke tobacco regularly?”
   1a) “During the last 2 weeks, how many cigarettes per day did you usually smoke?”
2) Smoking near bedtime: “in the last 2 weeks, how close to the time you went to bed did you usually finish your last cigarette?” (within 5, 6-30, 31-60 minutes, or more than one hour before bed).
*3) Overall alcohol use: “during the last 12 months, about how often did you drink alcohol?” (every day, nearly every day, 3-4 days a week, 1 or 2 days a week, 2 or 3 months, once a month, less than once a month, never/did not drink alcohol in last 12 months).
4) Alcohol use for sleep: “in the past year, did you ever drink alcohol to help you fall asleep?”
*4a) When you drank an alcoholic beverage in the last 2 weeks, how close to the time you went to bed did you usually finish your last drink?”
   (less than 30 minutes before bed, 30 to just under an hour, 1 to just under 2 hours, 2 to just under 4 hours, or 4 or more hours before bed).
**5) Caffeine use: “in the past two weeks, on average, how many cups of coffee did you drink per day?”
**5a) In the past two weeks, on average, how many cups of other caffeinated beverages did you drink per day, such as pop or tea?”
6) Napping: “How many days during the past two weeks did you nap?”
7) Time in bed: “Thinking about your average week, how many hours did you actually sleep, each day, during the past two weeks?”
   7a) “Thinking about your average weekend, how many hours did you actually sleep, each day, in the past two weeks?”
8) Reported likelihood of sleeping in on weekends: “in the past two weeks, did you sleep in on days you didn’t work?” (often, sometimes, rarely, or never true for you).
9) Time in bed: “At what time did you typically get up on weekdays (during the past two weeks)? And, at what time did you typically go to bed on weekdays (during the past two weeks)?”
10) “Thinking about your average weekday, how many hours did you actually sleep, each day (during the past two weeks)?”
11) “At what time did you typically get up on weekends (during the past two weeks)?”
12) “And, at what time did you typically go to bed on weekends (during the past two weeks)?”
13) “Thinking about your average weekend, how many hours did you actually sleep, each day (during the past two weeks)?”

*Combined questions to get an assessment of the number of drinks per week.
**Combined the two questions to get a total caffeine use per day.