Medical and Socio-Professional Impact of Insomnia

Damien Léger, MD, Biol D; Christian Guilleminault, MD, Biol D; Gary Bader, MD; Emile Lévy, PhD; and Michel Paillard, MD

Study Objectives: Insomnia, a highly prevalent disorder with direct and indirect economic and professional consequences, affects daytime functioning, behavior, and quality of life. Several studies have shown that insomnia affects the workforce and is associated with an increased risk of accidents. Insomnia may also play a role in other disorders. Our study attempted to evaluate the socio-professional correlates of insomnia by comparing a group of insomniacs to a group of good sleepers.

Design: With a questionnaire focused on the socio-professional and medical consequences of insomnia, we surveyed a group of severe insomniacs and a group of good sleepers. Persons with psychiatric disorders according to the DSM-IV minimum criteria for anxiety and depression were eliminated from each group. After screening, 240 insomniacs and 391 good sleepers remained and were then compared.

Measurements and Results: Compared to good sleepers, severe insomniacs reported more medical problems, had more physician-office visits, were hospitalized twice as often, and used more medication. Severe insomniacs had a higher rate of absenteeism, missing work twice as often as did good sleepers. They also had more problems at work (including decreased concentration, difficulty performing duties, and more work-related accidents).

Conclusions: Our study showed that insomnia has socio-professional consequences and is correlated with lower medical status.

Key words: Insomnia; familial; social costs; hospitalization; general population; survey; occupation

INTRODUCTION

INSOMNIA IS HIGHLY PREVALENT IN MANY COUNTRIES.1,2,3 SEVERAL STUDIES4,5 HAVE ESTIMATED THE DIRECT ECONOMIC CONSEQUENCES OF INSOMNIA, including costs related to diagnosis and treatment of insomnia and related problems. Some indirect economic consequences of insomnia have also been highlighted: Balter and Ulenhuth6 found that insomniacs had a 3.5 to 4.5 times greater risk of accidents than controls. In a Gallup survey, insomniacs were also 2.5 times more likely than controls to have accidents.1

Less apparent and less quantifiable are the indirect professional consequences of insomnia. Leigh found that insomnia was the greatest predictor (among 37 co-factors) of absenteeism.7 Lavie has also demonstrated that an individual’s job satisfaction is dependent upon quality of sleep,8 and Marchini et al found poor work efficiency in insomniacs compared to good sleepers.9

Insomnia has also been associated with an increased use of medical services8,10-11 and with the development of somatic and psychologic disorders12 such as alcoholism,13,14 depression,13 smoking,15 and morbidity in HIV patients.16 Other studies have shown an increased prevalence of insomnia in subjects with somatic or psychiatric diseases.11-13,17-19 This study was designed to estimate the medical and socio-professional consequences of insomnia by comparing a group of severe insomniacs (SI) with a matched group of good sleepers (GS) in the general population.

METHODS

Subjects and controls

SOFRES, a French polling institute, selected subjects for the study. SOFRES regularly surveys a group of 11,372 individuals who are representative of the general French population in age, gender, and socio-economic and professional status. Each individual received a questionnaire (Q1) that assessed insomnia based on the DSM-IV criteria.20 This questionnaire had previously been used in epidemiologic surveys to select groups of SI.21,22 The SI were categorized as having at least two sleep complaints (such as nonrefreshing sleep, early awakenings, or difficulties initiating or maintaining sleep) at least three times a week for at least 1 month. Of the 8625 individuals (76% of the total) who responded to the poll, 690 (8.1% of the total) were classified as SI. An age, sex, occupation, location, and marital-status-matched group of GS was also selected. The GS were defined as persons with no sleep difficulties.

Questionnaire Q2

The Q1 respondents were further screened with a second questionnaire, Q2. There were general questions on sex, age, occupation, marital status, geographic distribution, and other demographic information. Ten items were aimed at detecting psychiatric disorders, based on the DSM-IV definitions of anxiety and depression.

The second section of Q2 included 30 items used to investigate the socio-professional and medical implications of insomnia. Items already employed in previous economic studies23-24 were used. The first item asked subjects to detail their work schedules (ie, whether they were full-time, part-time, day, night or shift-type workers) and then to report on any work injury or leave of absence in the previous 12 months. For each leave of absence, subjects were asked to report the cause and duration. Two items were added to inquire about a) errors at work that had clear negative consequences and b) the frequency of tardiness during the previous month.

To investigate the relationship between insomnia and health, the French social security indicators25-27 were used. In France, patients are required to save their prescriptions in order to be reimbursed by social security. Subjects were asked to report the name, dose, and duration of intake of each medication and all medical consultations of the last 2 months. They provided the number of visits to general practitioners (GP) and specific specialists. Consultations for sleep problems were further detailed in 8 other items. We classified physician visits into direct and indirect categories. “Insomnia direct visits” would be the ones directly focused on the topic of insomnia. “Insomnia indirect visits” involved complaints indirectly due to insomnia. Also detailed were the duration, location, and cause of any hospitalization during the previous 12 months.

Disclosure Statement

Nothing to disclose.

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The last part of the questionnaire included queries about motor-vehicle accidents and items used in previous studies on sleep-related accidents. Subjects were asked if they drove, and if so, they were asked about their annual mileage, total number of accidents in the previous 12 months, and whether they were at fault in those accidents. We also added an item about the behavior of these subjects while driving.28 This question was then reformulated to ensure unambiguous meaning.

Subjects who met the DSM-IV minimum criteria for anxiety and depression were eliminated from each group; we were left with 240 SI and 391 GS (see Figure 1). No payment was provided to subjects to participate in the study.

Statistics

Gender differences in the groups were as follows: the SI group consisted of 26% males and 74% females, the GS group of 35% males and 65% females. There were no significant differences among the groups in age, marital and matrimonial status, or sociological-professional status (including the professional position of the head of the family, housing, and living conditions). A mathematical adjustment was performed to normalize the groups with respect to the gender ratio.

The “method of quotas” was used. The data were weighed with an adjustment based on the deviation between the SI group and the GS group. (For example, if the GS group consisted of 50% males and 50% females and the SI group of 25% males and 75% females, an adjustment coefficient of 2 would be given to the data collected from SI males and a coefficient of 2/3 to the data collected from SI females.) Statistical analyses were performed using t-test, chi-square and odds ratio (OR) with a level of significance of 95%, comparing SI to GS.

RESULTS

Direct Medical Consequences of Insomnia

The direct economic consequences assess all costs that might be directly related to insomnia (these include the costs of medications, medical visits, and the like). 53% of SI subjects versus 4% of GS subjects had at some time visited a doctor with the specific complaint of insomnia (p<.0001).

In the past year, 18% of SI had gone to visit either a GP (16%) or a specialist (2%) for insomnia, while 0% of GS visited a GP or a specialist (p<.0001). There were 0.34 (+/-1.56) consultations per SI subject versus 0 for the GS group (p=.0001).

In addition, 47% of SI and 0% of GS had discussed a sleep complaint with a doctor during a visit intended for another problem (p<.0001). The SI group averaged 1.17 (+/-2.78) visits versus 0.2 visits for the GS group (p<.0001). Twenty-eight percent of the SI and 0% percent of the GS had at some time visited a doctor with the specific complaint of insomnia (p<.0001).

In the past year, 18% of SI had gone to visit either a GP (16%) or a specialist (2%) for insomnia, while 0% of GS visited a GP or a specialist (p<.0001). There were 0.34 (+/-1.56) consultations per SI subject versus 0 for the GS group (p=.0001).

Indirect Medical Consequences Related to Insomnia

Indirect consequences of insomnia were assessed with data regarding health care, work-related accidents, and socioeconomic characteristics, which may be indirectly related to insomnia. The data were compared between the two groups.

Table 1A: Percentage of subjects visiting health professionals within 2 months of study

<table>
<thead>
<tr>
<th></th>
<th>Severe Insomniacs</th>
<th>Good Sleepers</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=240=100%</td>
<td>N=391=100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of subjects with at least 1 visit overall</td>
<td>82/240=34.2%</td>
<td>68/391=17.3%</td>
<td>2.15</td>
<td>1.43-3.25</td>
</tr>
<tr>
<td>To GP</td>
<td>71/240=29.6%</td>
<td>54/391=13.8%</td>
<td>2.07</td>
<td>1.45-2.96</td>
</tr>
<tr>
<td>To Specialists</td>
<td>30/240=12.5%</td>
<td>29/391=7.4%</td>
<td>1.05</td>
<td>0.73-1.52</td>
</tr>
<tr>
<td>To other HP</td>
<td>15/240=6.3%</td>
<td>8/391=2.1%</td>
<td>2.05</td>
<td>1.19-3.52</td>
</tr>
</tbody>
</table>

Table 1B: Percentage of subjects regularly on medications at survey time

<table>
<thead>
<tr>
<th></th>
<th>Severe Insomniacs</th>
<th>Good Sleepers</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=236=100%</td>
<td>N=387=100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of subjects on at least 1 drug</td>
<td>67/236=28.2%</td>
<td>44/387=11.4%</td>
<td>2.59</td>
<td>1.82-3.68</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>37/236=15.7%</td>
<td>27/387=7.0%</td>
<td>1.57</td>
<td>1.09-2.25</td>
</tr>
<tr>
<td>Beta blockers</td>
<td>23/236=9.8%</td>
<td>19/387=5.0%</td>
<td>1.28</td>
<td>0.84-1.93</td>
</tr>
<tr>
<td>Phlebotropics</td>
<td>14/236=6.0%</td>
<td>5/387=1.3%</td>
<td>3.15</td>
<td>1.68-5.92</td>
</tr>
<tr>
<td>Antiarrhythmics &amp; anticoagulants</td>
<td>11/236=4.7%</td>
<td>5/387=1.3%</td>
<td>2.4</td>
<td>1.25-4.84</td>
</tr>
</tbody>
</table>

Table 1C: Absenteeism due to sickness within previous 12 months

<table>
<thead>
<tr>
<th></th>
<th>Severe Insomniacs</th>
<th>Good Sleepers</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=80=100%</td>
<td>N=135=100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaves of absence</td>
<td>31/80=38.8%</td>
<td>19/135=14.3%</td>
<td>1.91</td>
<td>0.96-3.78</td>
</tr>
<tr>
<td>Percentage of subjects involved</td>
<td>19/80=23.8%</td>
<td>13/135=9.6%</td>
<td>1.50</td>
<td>0.87-2.98</td>
</tr>
<tr>
<td>Percentage of subjects with 1 leave of absence</td>
<td>9/80=11.3%</td>
<td>4/135=2.9%</td>
<td>2.55</td>
<td>0.99-6.59</td>
</tr>
<tr>
<td>Percentage with 2 leaves of absence</td>
<td>1/80=1.2%</td>
<td>0/135=0.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage with 3 leaves of absence</td>
<td>2/80=2.5%</td>
<td>2/135=1.5%</td>
<td>1.13</td>
<td>0.13-8.52</td>
</tr>
<tr>
<td>Percentage with &gt;3 leaves of absence</td>
<td>0/80=0.0%</td>
<td>0/135=0.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average number of leaves of absence</td>
<td>0.48 +/-1.60</td>
<td>0.24 +/-0.67</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Total group +/-SD</td>
<td>0.48 +/-1.60</td>
<td>0.24 +/-0.67</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Average duration of one leave of absence (days)</td>
<td>5.38 +/-15.40</td>
<td>3.62 +/-15.23</td>
<td>NS</td>
<td></td>
</tr>
</tbody>
</table>

GP: General practitioner; Specialists: Board-certified specialists; Other HP: Health professionals (psychologists, physiotherapists, etc.); OR: odds ratio; CI: confidence interval; P value: comparison between severe insomniacs and good sleepers; * p<0.01; # p<0.05; NS: not significant
Health Care Consequences of Insomnia

Table 1A shows the frequency of physician office visits in the two groups during the last 2 months. The SI visited their GP and other health professionals significantly more often than did good sleepers. There was no difference in visits to specialists. Routine follow-up visits also differed significantly \( p < .0001 \) between SI and GS (67% versus 44%).

Table 1B indicates the main differences between the two groups in the use of specific treatments (cardiovascular, central nervous system (CNS), other). The SI group took more medications than did the GS group, particularly more cardiovascular, CNS, urogenital, and gastrointestinal drugs. Fifty-nine percent of SI and 49% of GS had undergone a medical evaluation in the previous 6 months \( p = .0138 \) with an average of 2 (+/-3.6) evaluations for SI versus 1.2 (+/-2.2) for the GS \( p = .0198 \). The SI had had more blood studies (48% vs. 34%, \( p = .0005 \)) and radiologic procedures (17% vs. 10%, \( p = .0142 \)) than the GS. Eighty percent of SI and 92% of GS had been hospitalized during the previous 12 months \( p = .0001 \), with an average of 1.19 (+/-3.45) hospitalizations for SI versus 0.76 (+/-3.83) days for the GS (NS).

The analysis of admissions to specialty departments demonstrated that insomniacs were often hospitalized for gastrointestinal problems (11% vs. 33%). The GS were more often admitted to cardiology (5% vs. 2%) and trauma units (12% vs. 0%).

Work-related Consequences

Table 1C shows the differences between the two groups with regard to absenteeism from work.

The SI were absent from work due to illness more often than were GS. Fifteen percent of SI versus 6% of GS \( p < .001 \) reported having made errors at work over the previous month, which could have resulted in serious consequences. For 6% of SI versus 2% of GS, errors had occurred more than once during the previous month \( p = .0032 \). Twelve percent of SI versus 6% of GS reported being late to work during the previous month (NS). Six percent of SI versus 4% of GS had been late to work more than once in the previous month (NS). Moreover, 18% of SI versus 8% of GS \( p = .0004 \) felt that they had exhibited poor efficiency at work. Thirteen percent of SI versus 9% of GS reported difficulties completing complicated tasks at work (NS).

Accidents

Industrial accidents were more common \( p = .0150 \) over the past 12 months in SI (8%) than in GS (1%), with an average number of 0.07 (+/-0.25) accidents per SI versus 0.01 (+/-0.11) per GS \( p = .0550 \). There was no statistical difference between the groups when the annual incidence of driving accidents (9% vs. 10%) and near misses (5% vs. 4%) were compared; 65.8% of insomniacs versus 72.5% of good sleepers drove a car \( p = .012 \).

Family Life

We explored the possible long-term impact of insomnia on interactions with children. Sixteen percent of SI versus 3% of GS \( p = .0003 \) disliked assisting their children with homework. Thirty-three percent of SI versus 19% of GS frequently felt fatigued or irritated by their children \( p = .0006 \).

DISCUSSION

Criticism of Our Method

Our study is based on data from questionnaires. The definition of insomnia was based on criteria from the DSM-IV classification. As with most population-based surveys, no polysomnographic recordings
were performed. Our questionnaire was based on questions validated and used in previous studies.21,22 Finally, we acknowledge that we do not know if there was a somatic disorder responsible for the complaints of insomnia.

Because depression and anxiety disorders can affect daytime functioning and, thus, produce socio-professional consequences, we eliminated these patients from our study. It has already been shown that insomnia and psychiatric disorders, such as anxiety and depression, are related.13,18 By eliminating patients with anxiety disorders and depression, our study may underestimate the overall indirect socio-professional and “economic indicator” consequences of insomnia. This is particularly true for SI; 55.4% of SI with suspicion of anxiety or depression were excluded from the study. This is a high percentage: it demonstrates the impact that insomnia has had on the daily lives of these subjects. We do not, however, have any data on this particular group.

There is no validated questionnaire that assesses all the consequences of insomnia that are considered here: medical consumption, industrial and driving accidents, and professional performance. As a consequence, we used items from other questionnaires that investigated these different parameters independently.16,24,26-28

Discussion of the Results

1) Health status

Several studies have already looked at the links between insomnia and general health status. Although insomnia appears to be associated with poorer health status, it is difficult to know whether insomnia is the result or cause of the poorer health status.

Poor health leads to an increase in the use of medical services. This includes visits to doctors and other health professionals, intake of medications, and the number and duration of hospitalizations. The SI had a significantly higher number of visits to GP and other health professionals but not to specialists. In France, as in many countries, a GP can prescribe hypnotics for a maximum of 4 weeks. Chronic hypnotic users would need a visit and a new prescription every month. This requirement could explain the higher rate of visits to a GP. However, our survey showed that SI have an average of 0.31 visits per year specifically for their sleep problems and 1.17 visits per year for other problems during which sleep problems were also discussed. The estimated total annual rate of visits was 7.74 (1.29x6). Despite recommendation, a GP may prescribe a higher amount of hypnotics than the 4 weeks recommended dosage or refill prescription without a new office visit; the latter is unlikely, however, due to the drug reimbursement policy implemented by the social security system. It is much more likely, however, that the higher rate of visits to a GP in our study is due to other health problems than to the need for hypnotic prescription renewals. The lack of difference in the number of visits to specialists must be placed again in the context of the current social security and health insurance recommendations and the pressure to decrease referrals to specialists; as a result, many treatments are administered by a GP.

Our study parallels the results of Weyerer and Dilling.11 They found an average annual consultation rate among mild and moderately SI to be significantly higher compared to those without sleep disorders (10.61 and 12.87 consultations per year respectively, versus 5.25 per year for GS). Hospitalization was also twice as high among SI compared to GS. This is closely related to the percentage also reported by Weyerer and Dilling:21 21.9% (SI) versus 12.2% (GS). However, this last study included insomniacs with a psychiatric history. Lavie also found a higher rate of hospitalizations for insomniacs,8 as did Kales et al,29 who found an annual hospitalization rate of 15.7%. The average duration of each hospitalization was not different in our study between the two groups (6.3 days versus 7.4 days). The small number of hospitalized subjects (44 SI and 32 GS) limited the interpretation of these results.

Our SI used more medication (particularly cardiovascular, CNS, genitourinary, and gastrointestinal medications) than GS, as is shown in Table 1B. However, there was no difference in the use of analgesic medications, despite the fact that 46% of SI versus 29% of GS (p<.001) said they were particularly sensitive to pain. This is an important point, as pain may be an obvious cause of sleep disturbance. Kales et al29 have reported that poor mental and physical health were far more prevalent among insomniacs than controls.

Recently, Katz et al30 calculated the OR between chronic diseases and complaints of insomnia. Severe insomnia was strongly linked to current depression (OR=8.2), as well as to congestive heart failure (OR=2.5), obstructive airway disease (OR=1.6), and prostate problems (OR=1.6). They also found that men with systemic hypertension, bronchitis, diabetes, or rheumatic diseases complained more of sleep difficulties than did healthy men (p<.05).

Darko et al31 showed, in a prospective study, that fatigue and sleep disturbance were frequent symptoms of advanced HIV infection and emphasized the important alerting value of these complaints. These studies demonstrate that sleep complaints may be the presenting symptoms of underlying affective disorders or somatic diseases and particularly justify investigation for depression, cardiovascular, respiratory, and genitourinary diseases. Others have looked at more specific relationships, including coronary artery disease and heart rate variability30,31 without definitive conclusions.

Finally, the fact that insomnia can be a risk factor in elderly subjects for psychiatric diseases13 was more recently demonstrated. These findings have two implications. First, insomnia seems to be associated with poorer health status; indeed, insomniacs should be evaluated for psychiatric and somatic disorders. Second, although we cannot conclude in our cases whether insomnia was the cause of or the result of worsened health status, insomniacs are clearly at increased risk for certain diseases, and the higher use of medical services by insomniacs found in our study can be explained by this increased risk. Many of the findings reported to be consequences of insomnia are actually correlates. Until a cause-effect relationship is established, correlate or co-morbidity may be more accurate terms to describe the relationship between insomnia and poor medical status.

As we previously stated, in our study, we did not know, when we selected SI, if insomnia was primary or secondary to another disease. Therefore, we cannot conclude firmly that poor health is a consequence rather than a cause of insomnia.

2) Professional activity and absenteeism

The professional consequences of insomnia are also important in our results. Absenteeism was far more prevalent in SI, who missed twice as many workdays during the previous year than GS, despite the fact that we had matched our subjects for professional activities and work schedules. This is similar to the finding obtained by Leigh7 who surveyed 1308 workers and found insomnia to be the most predictable factor (out of 37) for absenteeism. Insomniacs in that study had an average monthly absenteeism rate 2.8 times that of the total group. However, as SI have more somatic disorders than GS do, it is again possible that an underlying disease may be responsible for both insomnia and absenteeism.

Insomnia also causes problems in coping with daily work. In our study, SI reported more difficulties with mental concentration and the accomplishment of work duties than GS did. In addition, there was an increased frequency of work-related accidents. This was also found by Mendelson, who reported on 691 untreated insomniacs,32 by Lavie, who reported less job satisfaction and less job productivity in insomniacs,8 and by Johnson and Spinweber,33 who demonstrated that SI in the Navy were slower at work and had poorer career advancement than GS.

3) Accidents

Our SI had seven times more industrial accidents than GS did, but traffic accidents were not significantly different between our groups. The risk of near accidents while driving was also similar in the two groups. The increased risk of industrial accidents is a new finding, and one explanation for this discrepancy between industrial and traffic accidents may be that SI may have avoided driving or driven shorter distances. In
our study, 65.8% of SI versus 72.5% of GS drove a car (p=0.012).

Conclusion

Our study demonstrated that insomnia is statistically associated with a poorer medical status and worse socio-professional indicators than is good sleep.

Insomniacs have more work-related accidents and a higher rate of absenteeism. Compared to GS, SI had a significantly higher rate of utilization of medical services, including more visits to healthcare professionals, medical examinations, medication, and hospitalization. We inferred, from these findings, that SI were in poorer health than GS were. It is possible that underlying health problems are responsible for both the increased use of medical services and the complaints of insomnia, and we cannot conclude definitively if insomnia is a cause or a consequence of this poorer status. However, this means that GP, family-practice, physicians, and internists should consider the complaint of insomnia as a signal to systematically search for more severe health problems. In the long run, prospective studies need to be performed that examine the development of certain diseases (especially, cardiovascular, genitourinary, and gastrointestinal diseases) in SI and GS, so that we can obtain a better understanding of the impact of insomnia on health and quality of life.

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REFERENCES


