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Insomnia and global sleep dissatisfaction in Finland

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SUMMARY The purpose of this study is to assess the prevalence of insomnia symptoms and diagnoses in the general population of Finland. A total of 982 participants, aged 18 years or older and representative of the general population of Finland, were interviewed by telephone using the Sleep-EVAL system. The participation rate was 78%. The questionnaire included the assessment of sleep habits, insomnia symptomatology according to Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) and International Classification of Sleep Disorders (ICSD), associated and sleep/mental disorders and daytime consequences. The overall prevalence of insomnia symptoms occurring at least three nights per week was 37.6%. Difficulty initiating sleep were mentioned by 11.9% of the sample, difficulty maintaining sleep by 31.6%, early morning awakenings by 11.0% and non-restorative sleep by 7.9% of the sample. Global dissatisfaction with sleep was found in 11.9% of the sample. Daytime consequences (fatigue, mood changes, cognitive difficulties or daytime sleepiness) were reported by 39.9% of participants with insomnia symptoms and 87.6% of those with sleep dissatisfaction. A deterioration of sleep in summer or winter was associated with more complaints of sleep dissatisfaction. Prevalence of any DSM-IV insomnia diagnosis was 11.7%. More specifically, DSM-IV diagnosis of primary insomnia had a prevalence of 1.6% and DSM-IV diagnosis of insomnia related to another mental disorder was at 2.1%. Insomnia was a symptom of another sleep disorder in about 16% of cases and of a mental disorder in about 17% of cases. As reported in other Nordic studies, sleep quality was worse in summer. Insomnia symptomatology was common and was reported by more than a third of Finnish participants. Compared with other European countries studied with the same methodology (France, the UK, Germany, and Italy), the prevalence of DSM-IV insomnia diagnosis was 1.5 to two times higher in Finland.

KEYWORDS DSM-IV classification, epidemiology, insomnia consequences, insomnia symptoms, insomnia diagnosis, seasonality

INTRODUCTION

Insomnia is a frequent symptom in the general population of western European countries. It is estimated that between 10 and 35% of the population have insomnia symptoms of various degrees of severity. Nordic countries of the Arctic Circle are characterized by a dark period during midwinter that is thought to play a role on circadian rhythms and insomnia complaints.

Insomnia symptoms were frequently studied in the general population of different areas of Sweden (Asplund and Aberg 1998; Gislason and Almqvist 1987; Hetta *et al.* 1999; Janson *et al.* 1995, 2001; Liljenberg *et al.* 1988; Mallon *et al.* 2000). In that country, the prevalence of insomnia symptoms varied from about 10 to 36%, depending on how insomnia was evaluated.

Two epidemiological studies were carried out in Norway. In one of them a prevalence of 11.7% of Diagnostic and

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Statistical Manual of Mental Disorders-IV (DSM-IV) insomnia criteria was reported for the whole country. They also reported an increase of difficulty initiating sleep (DIS) in southern Norway from summer to winter (Pallesen *et al.* 2001). Another study assessed sleeplessness in Tromso, a municipality located to the north of the Arctic Circle (Husby and Lingjaerde 1990). They reported that 41.7% of women and 29.9% of men of their sample were sometimes bothered by sleeplessness, especially in midwinter and summer.

In Finland, one community-based study (the Finnish twin cohort) on insomnia and daytime sleepiness was realized in 1990 (Hublin *et al.* 1996). A prevalence of 6.8% of insomnia and a prevalence of 6.7% of insufficient sleep were found.

This study, performed in the general population of Finland, aims (1) to assess the prevalence of insomnia symptomatology and disorders, (2) to identify daytime consequences of insomnia, (3) to verify if there is seasonal variability in sleep quality and if it is specific to certain areas of Finland, and (4) to allow comparison with other European countries on sleep disorders.

METHODS

Sample

This epidemiological study was performed in May, June, September and October 2000 to verify whether the end or the beginning of the dark period modified sleep patterns. The targeted population consisted of non-institutionalized individuals 18 years of age or older living in Finland. This age range represented approximately 4.1 million inhabitants.

The sample was drawn according to a two-stage procedure: in the first stage, official census data was used to divide the population according to its geographical distribution in Finland.

Telephone numbers were randomly pulled according to this stratification. In the second stage, the Kish method (Kish 1965), a controlled selection method, was applied to maintain the representation of the sample according to age and gender.

The participation rate (78.2%) was calculated based on the number of completed interviews ($n = 982$) divided by the number of eligible telephone numbers, which included all residential numbers not meeting any of the exclusion criteria ($n = 1256$). The participation rate was comparable between the different provinces of Finland with a difference of about 2% between most of the provinces. The northern part of Finland had very high participation rate (91%). In 73.6%, refusals occurred before any information on age and gender could be collected.

Interviewers explained the goals of the study to potential participants before requesting verbal consent. Excluded from the study were subjects younger than 18 years, those who were not fluent in Finnish ($n = 66$), or who suffered from a hearing or speech impairment ($n = 17$) or an illness ($n = 50$) that precluded them from being interviewed. The ethical committee of the Haaga Neurological Research Centre (Helsinki, Finland) approved the study.

Subjects who declined to participate were called a second time and asked again if they were willing to be part of the study. Subjects were classified as refusal if they declined a second time or when it was impossible to reach them a second time. Phone numbers were dropped and replaced only after a minimum of 10 unsuccessful dial attempts were made at different times and on different days, including weekdays and weekends. An added-digit technique, that is, increasing the last digit of a telephone number by one, was employed to control for unlisted telephone numbers (Landon and Banks 1977). The final sample consisted of 18.1% unlisted numbers.

Interviewers

The study was performed at the Haaga Neurological Research Centre (Helsinki, Finland). Sixteen native Finnish-speaking interviewers inexperienced in psychiatric assessment but who received special training on how to use the Sleep-EVAL system performed the interviews. The training was made by the Principal Investigator (MMO). It consisted mainly of role-playing, during which the interviewers practiced how to introduce the study and how to ask and answer the questions. They were instructed to read all the answer choices and to never decide for the subject what was the most appropriate answer. The team of interviewers was monitored daily by a supervisor.

It took on average five telephone calls to complete an interview. The average duration of the interviews was 71.4 ± 34 min. Interviewees on average answered 242 (±83) questions.

Instrument

The Sleep-EVAL system was specifically designed to administer questionnaires and conduct epidemiological studies on mental and sleep disorders in the general population (Ohayon 1995, 1999). It kept track of all telephone calls made, and managed the telephone calls and the Kish selection procedure.

A non-monotonic, level-2 inference engine enabled the Sleep-EVAL system to formulate a series of diagnostic hypotheses based on the responses to a standard questionnaire provided to all subjects. These hypotheses were confirmed or rejected through further questions and deductions. The system terminates the interview once all diagnostic possibilities are exhausted.

The system selects and phrases the questions to be administered and provides examples and instructions on how to ask them. The interviewer simply reads out the questions as they appear on the monitor and enters the responses. Questions can be close-ended (e.g. yes–no, present–absent–unknown, five-point scale) or open-ended (e.g. name of illness, duration). The Sleep-EVAL system included two neural networks. The inference engine that manages any uncertainty in the subject's answers as well as in criteria and diagnoses uses these neural

networks. The first neural network is a fixed one whose function is to manage fuzzy sets of answers. The second is unfixed. Its function is to calculate relative weights at the level of a criterion and also on a series of criteria. The cumulative weights are used to determine the presence or absence of a criterion or a diagnosis. In the end, each explored object (including diagnoses) will have a degree of certainty (or weight) ranging from 0.4 (completely present) to −0.4 (completely absent). Two classifications were implemented in the knowledge base of Sleep-EVAL: DSM-IV (APA 1994) and the International Classification of Sleep Disorders (ICSD) (AASM 1997). Concurrent mental and/or sleep diagnoses were allowed in accordance with the recommendations of the classifications. The system has been validated in various contexts and has been demonstrated to be reliable and valid (Hosn *et al*. 2000; Ohayon *et al*. 1999).

Assessed variables

The standard questionnaire of the Sleep-EVAL system covered: (1) sociodemographic information, (2) the sleep–wake schedule, (3) symptoms of sleep disorders, (4) sleep hygiene, (5) daytime consequences of sleep problems, (6) current and past consumption of alcohol, tobacco, coffee, (7) current and past consumption of medication for sleep, to reduce anxiety, antidepressants, (8) any other type of medication, (9) medical information: organic diseases, hospitalizations, medical consultations, blood pressure, (10) height and weight, and (11) DSM-IV and ICSD diagnoses.

Insomnia symptoms [DIS, disrupted sleep (DS), early morning awakening (EMA) and non-restorative sleep (NRS)] were assessed on a six-point frequency scale ranging from never to every night (or morning). An insomnia symptom was considered present when it occurred at least three nights/mornings per week.

Statistical analyses

Data were weighted to compensate for disparities between the final sample and the data of the official Finnish census. Bivariate analyses involving categorical or qualitative variables were carried out with chi-square statistics. Ninety-five percent confidence intervals were calculated for prevalence rates and odds ratios. Reported differences were significant at 0.05 or less.

RESULTS

The subjects were aged between 18 and 100 years. Men represented 48.2% of the sample and women 51.8%. Demographic characteristics of the sample are presented in Table 1. Half of the participants were married or living in common law; one-tenth were widowed. Daytime workers represented nearly 45% of the sample and shift or night workers accounted for about 14%. Almost all participants had completed at least 12 years of school.

Prevalence of insomnia symptoms

Difficulty initiating sleep occurring fewer than three evenings per week (occasionally) was reported by 15.3% of the sample. DIS occurred at least three evenings per week for 11.8% of the sample.

Disrupted sleep was occasionally reported (<3 nights per week) by 23.8% of the participants while DS occurring at least three nights per week was found in 31.7% of the sample.

Table 1 Demographic characteristics of the sample

	Men n (%)	*Women n (%)*	*Total n (%)*
Age groups (years)			
18–24	57 (12.1)	55 (10.8)	112 (11.4)
25–34	81 (17.1)	78 (15.3)	159 (16.2)
35–44	94 (19.9)	91 (17.9)	185 (18.8)
45–54	101 (21.4)	99 (19.4)	200 (20.4)
55–64	67 (14.2)	70 (13.8)	137 (14.0)
65+	73 (15.4)	116 (22.8)	189 (19.2)
Marital status			
Single	100 (21.1)	124 (24.4)	224 (22.8)
Married/comm. law	251 (53.2)	281 (55.2)	532 (54.2)
Sep./division	64 (13.5)	50 (9.8)	114 (11.6)
Widow	58 (12.2)	54 (10.6)	112 (11.4)
Occupation			
Daytime worker	207 (43.7)	234 (46.0)	441 (44.9)
Shift/night work	66 (13.9)	75 (14.7)	141 (14.3)
Unemployed	27 (5.7)	10 (2.0)	37 (3.8)
Not working	22 (4.6)	27 (5.3)	49 (5.0)
Student	14 (3.0)	17 (3.3)	31 (3.2)
Retired	138 (29.1)	146 (28.7)	284 (28.9)
Education level			
≤ 12 years school	41 (8.7)	36 (7.1)	77 (7.8)
12–15 years school	359 (75.9)	376 (73.9)	735 (74.8)
University grades	73 (15.4)	97 (19.1)	170 (17.3)

Early morning awakening was occasionally reported (< 3 mornings per week) by 23.9% of the sample and another 11% said EMA occurred at least three mornings per week.

Non-restorative sleep was occasionally reported (< 3 mornings per week) by 19% of the sample and 7.9% of the participants said it occurred at least three mornings per week.

At least one of these symptoms was reported by 37.6% of the participants. More specifically, 21% of the sample reported only one symptom; 9.6% reported two symptoms; 5.7% three symptoms and 1.4% four symptoms.

Global dissatisfaction with sleep was found in 11.9% of the sample.

Table 2 presents prevalence of insomnia symptoms by gender; no significant difference was observed.

Table 3 indicates that separated or divorced individuals had higher rates of DIS, while widowers had higher rates of DS and EMA. Prevalence of NRS and global sleep dissatisfaction (GSD) did not vary according to marital status. Generally speaking, unemployed individuals had higher rates of DIS, DS, EMA and NRS.

Consequences

Daytime consequences

Daytime consequences of poor sleep were examined in relationship with each insomnia symptom and GSD. As seen in Table 4, daytime consequences are mostly not higher in subjects with insomnia symptoms, with the exception of daytime fatigue and motor difficulties (lack of coordination, psychomotor retardation) that were more frequently reported by subjects with NRS than by subjects without NRS.

The situation was very different in subjects with GSD: each group of daytime consequences was about five times higher in subjects dissatisfied with their sleep as compared with satisfied subjects (Table 4).

Medical consultations for sleep disturbances

Consultations for sleep disturbances were infrequent in subjects with DIS (6.8%), DS (4.2%) and EMA (7.4%). Subjects with NRS (14.1%) or GSD (15.2%) were more likely to consult their sleep disturbances ($P < 0.001$).

Use of sleep-promoting medication

Use of sleep-promoting medication was reported by 8.4% of the sample. Subjects with DIS (9.4%), DS (8.7%) or EMA (8.3%) did not use more frequently sleep medication than subjects without these symptoms. NRS (17.9%) and GSD (33.0%) were associated with higher rates of sleep medication usage ($P < 0.001$).

Seasonality

A worsening of sleep quality in spring was reported by 9.7% of the sample; 20.4% of the sample said their sleep got worse in summer; 4.9% in autumn; and 4.4% in winter.

The GSD was significantly higher in participants who reported having poorer sleep during summer (17.0%)

Table 2 Prevalence of insomnia symptoms by gender

	Total (n = 982) % (95% C.I.)	*Men (n = 473) % (95% C.I.)*	*Women (n = 509) % (95% C.I.)*
Difficulty initiating sleep ≥3 evenings per week	11.8 (9.8–13.9)	10.4 (7.7–13.2)	13.2 (10.3–16.2)
Disrupted sleep ≥3 nights per week	31.7 (28.7–34.5)	30.2 (26.1–34.4)	33.0 (28.9–37.1)
Early morning awakening ≥3 mornings per week	11.0 (9.1–13.0)	9.7 (7.1–12.4)	12.2 (9.4–15.1)
Non-restorative sleep ≥3 mornings per week	7.9 (6.3–12.0)	7.0 (4.7–9.3)	8.8 (6.3–11.3)
Global sleep dissatisfaction	11.9 (9.9–14.0)	9.3 (6.7–12.0)	14.3 (11.2–17.5)

Table 3 Prevalence of insomnia symptoms by marital status and occupation

	n	*DIS (%)*	*DS (%)*	*EMA (%)*	*NRS (%)*	*GSD (%)*
Marital status						
Single	224	17.0	26.5	7.6	10.3	9.3
Married/comm. law	533	7.3	29.1	10.3	6.8	14.1
Sep./division	115	21.9*	36.8	12.2	9.6	9.9
Widowed	111	12.6	48.6*	19.8*	8.1	9.2
Occupation						
Daytime worker	442	7.7	21.5	5.9	7.0	12.2
Shift/night work	141	13.5	26.2	12.8	5.7	8.8
Unemployed	37	29.7*	55.6*	30.6*	21.6*	9.1
Not working	48	14.3	47.9	12.2	16.3	12.5
Student	31	9.7	20.0	6.5	3.2	10.0
Retired	283	14.8	45.4	16.3	7.8	13.6

DIS, difficulty initiating sleep; DS, disrupted sleep; EMA, early morning awakening; NRS, non-restorative sleep; GSD, global sleep dissatisfaction.
*Chi-square $P < 0.01$.

compared with subjects who did not report changes in their sleep quality (10.6%; $P < 0.001$). Similarly, subjects who said their sleep worsened in winter were four times more likely to be dissatisfied with their sleep (35.7%) than the other participants (10.8%; $P < 0.001$).

We also verify whether there were differences on the report of insomnia symptoms and GSD between subjects who were interviewed at the end of the dark period and those interviewed at the beginning of the dark period. Generally speaking, there was no significant difference. Only a trend was observed for DIS which had a higher prevalence in individuals interviewed at the beginning of the dark period (15.5% vs. 10.8%; $P = 0.06$).

DSM-IV diagnoses

Insomnia symptoms can be indicative of different types of DSM-IV diagnoses. Table 5 presents the associations between insomnia symptoms and insomnia disorder diagnoses, other sleep disorder diagnoses and mental disorder diagnoses. DSM-IV insomnia disorder diagnoses include 'Primary insomnia' with a prevalence of 1.6%, 'Insomnia related to Another Mental Disorder' with a prevalence of 2.5%, 'Sleep Disorder Due to a General Medical Condition (insomnia type)' with a prevalence of 1.0%, and 'Substance-Induced Sleep Disorder (insomnia type)' with a prevalence of 7.8%. The total prevalence of any DSM-IV insomnia disorder diagnoses was 11.7%.

As can be seen in Table 5, around 10% of individuals with DIS, DS or EMA had a DSM-IV insomnia disorder diagnosis; this was 16.7% in subjects with NRS and 40.2% in those dissatisfied with their sleep.

A diagnosis of dyssomnia not otherwise specified was the most common other sleep disorder diagnosis. This diagnosis is a catchall category that includes diagnoses such as insufficient sleep syndrome, restless legs syndrome and insomnia symptoms for which it was not possible to identify a principal

Table 4 Daytime consequences of poor sleep by insomnia symptoms and global sleep dissatisfaction

	Fatigue (%)	*Mood changes (%)*	*Cognitive impact (%)*	*Motor diff. (%)*	*Daytime sleepiness (%)*
Difficulty initiating sleep					
No ($n = 865$)	21.8	17.6	23.0	1.6	19.4†
Yes ($n = 117$)	25.6	12.9	21.4	3.4	10.5
Disrupted sleep					
No ($n = 671$)	22.4	16.7	24.0	1.0	17.3
Yes ($n = 311$)	22.2	18.0	20.0	3.2	20.7
Early morning awakening					
No ($n = 874$)	22.4	17.6	23.3	1.7	18.1
Yes ($n = 108$)	22.0	12.0	18.5	1.8	21.2
Non-restorative sleep					
No ($n = 904$)	21.2	16.6	22.1	1.4	17.8
Yes ($n = 78$)	34.6*	21.8	29.5	5.1†	24.7
Global sleep dissatisfaction					
No ($n = 870$)	16.1	11.8	17.3	0.6	13.4
Yes ($n = 112$)	67.0*	55.8*	63.4*	10.6*	51.3*

*Chi-square $P < 0.001$; †Chi-square $P < 0.01$.

Table 5 The DSM-IV diagnoses by insomnia symptoms and global sleep dissatisfaction

Diagnoses	*DIS ($n = 117$)*	*DS ($n = 311$)*	*EMA ($n = 108$)*	*NRS ($n = 78$)*	*GSD ($n = 112$)*
DSM-IV insomnia disorder	12.8	11.6	9.3	16.7	40.2
Substance-induced sleep disorder (insomnia type)	10.1	6.8	8.0	13.5	22.6
Related to a mental disorder	0.9	2.9	0.9	3.8	11.6
Due to a general medical condition (insomnia type)	0.9	0.6	0.0	0.0	4.5
Primary insomnia	1.9	2.4	1.0	0.0	7.6
Other DSM-IV sleep disorders	13.7	17.4	15.7	21.8	30.1
Circadian rhythm disorder	5.2	2.3	5.6	7.7	11.6
Sleep breathing disorder	2.6	7.1	4.6	7.7	7.1
Dyssomnia not otherwise specified	6.0	10.3	8.3	10.3	14.2
DSM-IV mental disorders	17.2	19.9	18.5	15.4	36.3
Bipolar disorders	3.4	2.3	0.9	2.6	6.3
Depressive disorders	0.9	3.9	2.9	2.6	7.1
Anxiety disorders	13.7	15.4	17.6	11.5	24.1
Adjustment disorder	0.0	1.6	0.9	1.3	8.0
At least one DSM-IV disorder	33.3	39.5	37.0	43.6	74.1

All the values are given in percentages.
DSM-IV, Diagnostic and Statistical Manual of Mental Disorders-IV; DIS, difficulty initiating sleep; DS, disrupted sleep; EMA, early morning awakening; NRS, non-restorative sleep; GSD, Global sleep dissatisfaction.

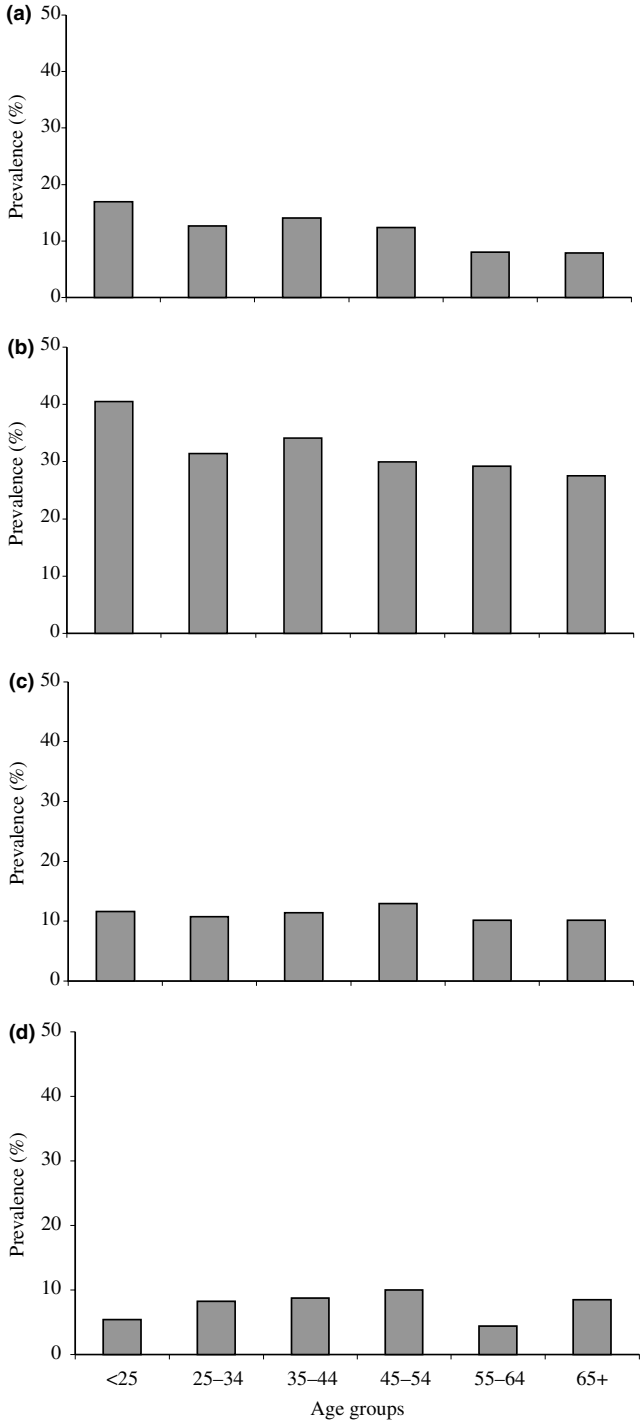

Figure 1. (a) Prevalence of difficulty initiating sleep by age group. (b) Prevalence of disrupted sleep by age group. (c) Prevalence of early morning awakening by age group. (d) Prevalence of non-restorative sleep by age group.

cause. About 7% of DS and NRS subjects and subjects dissatisfied with their sleep had a sleep breathing disorder.

Not surprisingly, an anxiety disorder was the most frequent mental disorder diagnosis for all groups. Subjects dissatisfied with their sleep were the most likely to have this category of diagnosis (24.1%) followed by EMA subjects (17.6%) and DS subjects (15.4%).

When the three categories of diagnoses were summed up, we found that 74.1% of subjects dissatisfied with their sleep had at least one diagnosis, followed by NRS subjects (43.6%), DS subjects (39.5%), EMA subjects (37.0%) and DIS subjects (33.3%).

DISCUSSION

This study performed in the general population of Finland shows that insomnia symptoms occurring at least three times per week affected more than a third of the participants. Insomnia disorder diagnoses are also high in Finland: 11.7% of the sample had a DSM-IV insomnia disorder diagnosis.

How this study compared with other studies in Nordic countries of the Arctic Circle

Using a comparable frequency, Hetta *et al.* (1999) found a prevalence of insomnia symptoms of 22% in Sweden. Janson *et al.* (1995), using a sample of young adults (20–45 years old), reported a prevalence between 6 and 9% for difficulties initiating sleep; in this sample we found 13.4% for the same age group. EMA had a prevalence between 5 and 6% in the Janson *et al.*'s (1995) study; it was 10.1% in ours. Our prevalence rates were therefore about 1.5 times higher. Comparisons with the Hublin *et al.* (1996) study performed in Finland are difficult to make because different variables were assessed. In the Hublin's study, insomnia was measured with the question 'How often do you suffer from sleeplessness?' They found a prevalence of 3.4% who answered nightly or almost nightly in their sample. The closest question we had was 'How often do you have a bad night's sleep?' which gave a prevalence of 2.2% who answered nightly or almost nightly with respect to the same age group (33–60 years old). A Norwegian study (Pallesen *et al.* 2001) used DSM-IV criteria to assess insomnia in the general population. They reported a prevalence of 11.7% of their sample that fits the DSM-IV definition. This is very close to our prevalence of 11.3% of subjects who had a DSM-IV insomnia disorder diagnosis.

As reported in other epidemiological studies, we found that a greater number of participants said their sleep got worse in summer compared with the rest of the year. This seasonality was not associated with a specific insomnia symptom but with sleep dissatisfaction.

How this study compared with other studies performed using the same methodology

Finland has a unique pattern of insomnia compared with other European countries where the same methodology was used. Generally speaking, similarities are found among the UK, Germany and France, while Italy and Spain are similar. In this study, the prevalence of DIS was comparable with the UK (Ohayon *et al.* 1997), France and Italy (Ohayon and Smirne

2002) but lower than in Germany (Ohayon and Zulley 2001). The prevalence of DS was similar to that reported for France but higher than in the UK, Germany, Italy, Portugal and Spain. The prevalences of EMA and NRS in Finland were comparable with that observed in southern countries (Italy, Spain and Portugal) and lower than that observed in the UK, Germany and France. The percentage of the sample dissatisfied with their sleep was comparable with France (Ohayon 1997) and higher than in other countries (Ohayon and Smirne 2002; Ohayon and Zulley 2001; Ohayon *et al*. 1997).

The prevalence of DSM-IV insomnia disorder diagnoses was nearly two times higher than that observed in France (Ohayon 1997), the UK, Germany (Ohayon and Zulley 2001), Italy (Ohayon and Smirne 2002), Spain and Portugal (Ohayon *et al*. 2001). An examination of the specific diagnoses revealed that the observed difference is caused by a higher number of participants with a diagnosis of substance-induced sleep disorder (insomnia type). In the other studied European countries, this prevalence is 1% or below; the prevalence is seven times higher in this study (7.8%). Circadian rhythm disorders are also at least two times higher (3.0%) than in the other studied European countries (0.1–1.5%).

Contrary to most other epidemiological studies, men and women were comparable for all insomnia symptoms and GSD. Insomnia disorder diagnoses were more prevalent in women (14.9%) than in men (7.4%). More specifically, insomnia related to another mental disorder and primary insomnia were more frequent in women than in men, which is congruent with previous findings (Ohayon *et al*. 1997, 2001; Ohayon and Smirne 2002).

The prevalence of insomnia symptoms remained comparable between age groups (see Fig. 1). This is uncommon especially for DS that usually is reported to increase with age. Interestingly, the prevalence of DS in participants 55 years and older is comparable with that observed in other epidemiological studies. The difference in the prevalence is among the youngest participants, where we registered a clearly higher prevalence than in other epidemiological studies.

As already pointed out in other studies (Ohayon and Roth 2001; Ohayon and Zulley 2001), when using only a frequency criterion to assess the prevalence of insomnia symptoms, we found that many participants with insomnia symptoms did not fit in any diagnosis category and reported little or no daytime consequences for their insomnia symptoms. On the other hand, global GSD is associated with a specific diagnosis in three quarter of cases and almost always to daytime consequences. These subjects were also more likely to consult a physician about their sleep disturbances or to use a medication to improve sleep quality. These results suggest that GSD is a better indicator of the sleep disturbance severity than insomnia symptoms alone. This symptom should be systematically assessed in epidemiological studies in addition to insomnia symptoms. It can also be used by clinicians to quickly identify individuals who might have sleep disturbances.

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REFERENCES

American Academy of Sleep Medicine (AASM). *The International Classification of Sleep Disorders Revised: Diagnostic and Coding Manual (ICSD)*. American Academy of Sleep Medicine, Rochester, MN, 1997.

American Psychiatric Association (APA). *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)*, 4th edn. The American Psychiatric Association, Washington, 1994.

Asplund, R. and Aberg, H. Sleep and cardiac symptoms amongst women aged 40–64 years. *J. Intern. Med.*, 1998, 243: 209–213.

Gislason, T. and Almqvist, M. Somatic diseases and sleep complaints: an epidemiological study of 3201 Swedish men. *Acta Med. Scand.*, 1987, 221: 475–481.

Hetta, J., Broman, J. E. and Mallon, L. Evaluation of severe insomnia in the general population-implications for the management of insomnia: insomnia, quality of life and healthcare consumption in Sweden. *J. Psychopharmacol.*, 1999, 13 (4 Suppl. 1): S35–S36.

Hosn, R., Shapiro, C. M. and Ohayon, M. M. Diagnostic concordance between sleep specialists and the sleep-EVAL system in routine clinical evaluations. Abstract. *J. Sleep Res.*, 2000, 9 (Suppl. 1): 86.

Hublin, C., Kaprio, J., Partinen, M., Heikkila, K. and Koskenvuo, M. Daytime sleepiness in an adult, Finnish population. *J. Intern. Med.*, 1996, 239: 417–423.

Husby, R. and Lingjaerde, O. Prevalence of reported sleeplessness in northern Norway in relation to sex, age and season. *Acta Psychiatr. Scand.*, 1990, 81: 542–547.

Janson, C., Gislason, T., De Backer, W., Plaschke, P., Bjornsson, E., Hetta, J., Kristbjarnason, H., Vermeire, P. and Boman, G. Prevalence of sleep disturbances among young adults in three European countries. *Sleep*, 1995, 18: 589–597.

Janson, C., Lindberg, E., Gislason, T., Elmasry, A. and Boman, G. Insomnia in men-a 10-year prospective population based study. *Sleep*, 2001, 24: 425–430.

Kish, L. *Survey Sampling*. John Wiley & Sons Inc., New York, 1965.

Landon, E. L. and Banks, S. K. Relative efficiency and bias of plus-one telephone sampling. *J. Marketing Res.*, 1977, 14: 294–299.

Liljenberg, B., Almqvist, M., Hetta, J., Roos, B. E. and Agren, H. The prevalence of insomnia: the importance of operationally defined criteria. *Ann. Clin. Res.*, 1988, 20: 393–398.

Mallon, L., Broman, J. E. and Hetta, J. Relationship between insomnia, depression, and mortality: a 12-year follow-up of older adults in the community. *Int. Psychogeriatr.*, 2000, 12: 295–306.

Ohayon, M. *Knowledge Based System Sleep-EVAL. Decisional Trees and Questionnaires*. National Library of Canada, Ottawa, 1995.

Ohayon, M. M. Prevalence of DSM-IV diagnostic criteria of insomnia: distinguishing insomnia related to mental disorders from sleep disorders. *J. Psychiatr. Res.*, 1997, 31: 333–346.

Ohayon, M. M. Improving decision making processes with the fuzzy logic approach in the epidemiology of sleep disorders. *J. Psychosom Res.*, 1999, 47: 297–311.

Ohayon, M. M. and Roth, T. What are the Contributing factors for insomnia in the general population? *J. Psychosom. Res.*, 2001, 51: 745–755.

Ohayon, M. M. and Smirne, S. Prevalence and consequences of insomnia disorders in the general population of Italy. *Sleep Med.*, 2002, 3: 115–120.

Ohayon, M. M. and Zulley, J. Correlates of global sleep dissatisfaction in the German population. *Sleep*, 2001, 24: 780–787.

Ohayon, M. M., Caulet, M., Priest, R. G. and Guilleminault, C. DSM-IV and ICSD-90 insomnia symptoms and sleep dissatisfaction. *Br. J. Psychiatry*, 1997, 171: 328–382.

Ohayon, M. M., Guilleminault, C., Zulley, J., Palombini, L. and Raab, H. Validation of the Sleep-EVAL system against clinical assessments of sleep disorders and polysomnographic data. *Sleep*, 1999, 22: 925–930.

Ohayon, M. M., Paiva, T. and Sagales, T. Comparison of insomnia prevalence in the general population of Portugal and Spain. *Sleep*, 2001, 24 (Abst.Suppl.): A345.

Pallesen, S., Nordhus, I. H., Nielsen, G. H., Havik, O. E., Kvale, G., Johnsen, B. H. and Skjotskift, S. Prevalence of insomnia in the adult Norwegian population. *Sleep*, 2001, 24: 771–779.