

The Problem of Long-Term Insomnia: a 5-Year Follow-Up Study in a Middle-Aged Population

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The prevalence and evolution of insomnia during 5-year follow-up was studied in a randomly selected middle-aged population in Finland. In the original study a structured sleep questionnaire was completed by 1190 subjects (549 men and 641 women) and a 5-year follow-up questionnaire was returned by 626 (264 men and 362 women). Insomnia symptoms (at least 1-2 x/wk) during past three months were reported by 9.1% of men and 9.7% of women in the first survey, while the mean age of the subjects was 43.7 years. Mild insomnia symptoms (1-2 x/wk) was reported by 6.4% and severe (3-7x/wk) by 3.1% of subjects. Insomnia was a daily problem to 0.5% of men and 1.3% of women. Five years later the prevalence of insomnia had increased especially among women in menopausal age. The highest percentages of insomnia were found among 51-year-old and 55-year-old women: 19.8% and 27.4%, respectively. Insomnia had been a long-term problem (reported in both surveys) for 5.4% of subjects, the 5-year persistence of the symptom was 57.6%. Insomnia was associated with subjective sleepiness and fatigue, but not with increased frequencies of sleepiness-related traffic accidents. Insomniacs felt more often depression and regarded themselves nervous and tense; they were also more often unsatisfied with their quality of life. At the time of the follow-up survey when the oldest age-group was 55 years, the insomniacs were less often employed than the others: men with weekly insomnia were more often retired than others, whereas female insomniacs were more often unemployed. (*Sleep and Hypnosis* 2001;3(3):97-105)

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INTRODUCTION

The prevalence of insomnia has been studied in many populations with different definitions of insomnia. The International Classification of

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Sleep Disorders (1) defines insomnia also in its mildest form as an almost nightly complaint of an insufficient amount of sleep, or not feeling rested after the habitual sleep episode. The severity of insomnia is determined by the impairment of social and occupational functioning. In a recently published large epidemiological study where the DSM-IV criteria were used for the definition of insomnia the prevalence of insomnia was 18.6% (14.0% for men and 22.8% for women, age over 18 years) and severe insomnia was found in 9.3% (6.3% of men and 12.0% of women) (2). In most studies the numbers of insomniacs are higher among women than men and the prevalence increases with age.

Most studies concern acute complaints or

short time periods, mostly one month. Natural evolution of insomnia during months or years is less known. There are a few studies on the persistence of sleep complaints: Ganguli and colleagues studied 2-year persistence of subjective sleep complaints in a rural older population. In their study, the mean age of the study population was 74.4 years, the prevalence of difficulty in initiating sleep (DIS) was 36.7%, the prevalence of difficulty in maintaining sleep (DMS) 28.7% and, of early morning awakenings (EMA) 19.1%. The 2-year persistences were 74.9%, 68.9% and 47.3%, respectively (3). Hyypä and colleagues published an eight-year follow-up study among adult Finns, where the mean age was 48.6 years. The prevalence of difficulty in initiating and maintaining sleep (DIMS) was 39% in the initial screening and 47% after 8-years of follow-up. The chronicity of the symptom was 73% (4). Hohagen and colleagues published a longitudinal study on insomnia (5), where they studied 2512 patients (age 18-65 years) for two years and found that although 23.9% of the 18.7% with severe insomnia used habitually hypnotics, only 22% of them had significantly improved at the time of 2-year-follow-up.

The present report is a part of a larger 5-year follow-up study on sleep, sleepiness and living habits. Our previous reports have dealt with the natural evolution of snoring (6) and sleepiness (7). The present study draws attention to the prevalence and natural evolution of insomnia in middle-age.

METHODS

The study was carried out at the UKK Institute in Tampere, Finland, by means of repeated mailed questionnaire surveys. There were altogether 79 items in the original and 78 in the follow-up questionnaire, but only 18 of the former and 24 of the latter were used in the present study. The essential part of the structured questions used in this study were based on the Basic Nordic Sleep Questionnaire (BNSQ) (8) used in many other epidemiological studies in Finland and other countries (9-13).

Most questions concentrated on the past three months. The questions dealing with insomnia, sleepiness, sleep disturbances and living habits were identical in the baseline and the 5-year follow-up survey. The question on probable causes of awakenings included seven premeditated and one open alternative. The alternatives were: "1. I do not usually wake up during the night 2. nightmares 3. worries 4. need of relief 5. noise, light 6. children 7. other relatives 8. pains 9. other cause, what?"

The questions on insomnia in general and the three types of insomnia (difficulty initiating sleep (DIS), early morning awakenings (EMA), fragmentary sleep (DMS)) all had six alternative answers. The questions were formulated as follows: Have you suffered from insomnia during the past three months? (insomnia in general) Have you had difficulty initiating sleep during the past three months? (DIS) Has your sleep been fragmentary during the past three months? (DMS) Have you woken up too early in the morning and could not fall asleep again during the past three months? (EMA) and the alternative answers were such as: 1. never 2. less than once per month 3. less than once per week 4. 1-2 nights per week 5. 3-5 nights per week 6. every or almost every night. Answers to these questions were grouped according to the following definitions: subjects with insomnia symptoms less than once per week were "normal sleepers", subjects with at least weekly symptoms were "insomniacs"; symptoms 1-2 nights per week ment "mild insomnia" and at least 3-5 nights per week ment "severe insomnia".

The question on the quality of sleep was formulated: "How well do you usually sleep?" and the alternative answers were: well, rather well, sufficiently, rather badly, badly.

Sleepiness symptoms were asked by three structured questions and the definition "sleepy" was used to mean subjects reporting any of these types of sleepiness. The cut-off points for excessive daytime sleepiness were: daily for daytime sleepiness, weekly for an involuntary tendency to fall asleep during ordinary tasks and more or clearly more tired than friends or

colleagues.

There was also a question on the subjects' satisfaction with their present social relationships and quality of life. Both questions included five alternatives. In another three questions, the subjects were asked whether the following statement fitted well, rather well, badly or not at all to their state of mind: "I am usually very tense and nervous", "In the evening I am very fatigued, both mentally and physically" and "I have a positive attitude and I do not worry too much". The question on depression was formulated among other 12 diseases mentioned "Have you now or have you previously had any of the following diseases? Please, note also your current medical therapy for the disease in question".

Original study

The subjects comprised a stratified random sample (N= 1600) of the adult population of Tampere including 200 men and 200 women from each of the age groups 36-, 41-, 46- and 50-years. The questionnaire was completed by 1190 people (549 men and 641 women), a response rate constituting 75% of the total sample (69% of men and 81% of women).

Follow-up study

The 5-year follow-up study involved those 1190 subjects who responded in the first survey. They were first informed about the study in order to motivate them to participate. After checking possible new addresses it was found that eight persons were deceased, one lived abroad, 172 could not be reached and 205 refused to participate. The questionnaire was mailed to the remaining 801 people and was completed after one request by 626 (78.2% of the 801; 264 men and 362 women), a response rate of 53% of the respondents in the original study (48% of the men and 57% of the women). The respondents did not differ significantly from the non-respondents regarding age or prevalence of sleep disturbances in the first survey. The age of the subjects at baseline was

36-50 years and at follow-up 41-55 years.

Statistical analysis

The analysis was made among subjects who answered in both surveys comparing insomniacs to normal sleepers. The factors associated with insomnia were studied by cross-tabulations and by logistic regression models. The significance of observed differences was tested by Pearson's chi-square test in cross tabulations. In logistic regression models the fit of the model was measured using goodness-of-fit chi-square. In the latter case the results are presented using odds ratios (OR) with 95% confidence intervals (95% CI). The model selection was carried out stepwise, where the limits to enter and remove the variables were 0.10 and 0.15, respectively (the usual default values). Computation was carried out using the BMDP statistical Software (Version 1993) in a SUN/UNIX mainframe.

RESULTS

Prevalence of insomnia

Mild insomnia symptoms (1-2 times per week) were reported by 6.4% at baseline and 10.6% after 5-year follow-up and severe insomnia (3-7 times per week) by 3.1% and 3.4% of subjects, respectively. The prevalence of insomnia symptoms is shown in Table 1. The proportion of subjects with difficulty in initiating sleep was very similar to the proportion of subjects with insomnia. Fragmentary sleep (DMS) was a more common phenomenon (percentages of follow-up survey in parenthesis): as mild symptom in 13.2 (17.2) % and severe in 11.8 (18.2) %, even on daily basis 5.7 (10.6)%. Mild EMA was reported by 13.2 (11.8) % and severe EMA by 4.5 (6.6) %, respectively.

Persistence of insomnia

The answers to the question on insomnia in the first survey and in the 5-year follow-up are shown in Table 2. Insomnia symptoms had been stable in 46%, increased in 32.5% and

Table 1. Prevalence of mild and severe insomnia symptoms during past three months at baseline and after 5-year follow-up

	MEN		WOMEN	
	Baseline N (%)	Follow-up N (%)	Baseline N (%)	Follow-up N (%)
Insomnia symptoms				
"normal sleepers"				
never	120 (45.6%)	116 (44.1%)	139 (38.7%)	102 (28.4%)
<1x/month	72 (26.4%)	69 (26.2%)	106 (29.5%)	117 (32.6%)
<1x/wk	47 (17.9%)	52 (19.8%)	79 (22.0%)	79 (22.0%)
<1x/wk	239 (90.9%)	237 (90.1%)	324 (90.3%)	298 (83.0%)
"insomnia"				
"mild insomnia"				
1-2x/wk	19 (7.2%)	20 (7.6%)	21 (5.8%)	46 (12.8%)
"severe insomnia"				
3-5x/wk	4 (1.5%)	2 (0.8%)	10 (2.8%)	9 (2.5%)
daily/almost	1 (0.4%)	4 (1.5%)	4 (1.1%)	6 (1.7%)
at least once a week	24 (9.1%)	26 (9.9%)	35 (9.7%)	61 (17.0%)

Table 2. Persistence of insomnia during 5-year follow-up

	Insomnia after five years						Total (N)
	never (N)	<1x/month (N)	<1x/week (N)	1-2x/week (N)	3-5x/week (N)	nightly/almost (N)	
Insomnia at baseline							
Never	147	73	29	4	2	4	259
less than once per month	52	69	42	12	3	0	178
less than once per week	14	37	47	26	0	2	126
1-2 nights per week	4	6	8	18	3	1	40
3-5 nights per week	1	1	4	4	3	1	14
every or almost every night	0	0	1	2	0	2	5
Total	218	186	131	66	11	10	622

Number of subject with the same frequency of insomnia in both surveys are bold faced.

decreased in 21.5% of subjects during the five follow-up years. Furthermore, of the subjects who had been normal sleepers five years ago 90.6% were still normal sleepers, 9.4% had become insomniacs; 7.5% had mild insomnia symptoms and 2.0% severe. From subjects who had been insomniacs in the first survey, 42.4% were normal sleepers and 57.6% had still insomnia five years later. From subjects who had mild insomnia in the first survey 45%

were normal sleepers and 45% had still mild insomnia and 10% had severe insomnia in the 5-year follow-up. From severe insomniacs 36.8% were normal sleepers, 31.6% had mild insomnia and 31.6% were severe insomniacs also five years later. Only 2 subjects (0.3%) had insomnia every night in both surveys.

Insomnia was somewhat more common among women than men, especially in the age-groups 51- and 55-year-olds where the per-

percentages of women with weekly insomnia were as high as 19.8% and 27.4%, respectively. After 5-year follow-up insomnia had significantly increased especially among women over 50 years (Figures 1 and 2). Persistence of weekly insomnia during the five-year follow-up was 62.5% among men but 54.3% among women.

up among insomniacs did not significantly differ from those of other subjects, but typical features in insomniacs' sleep were longer sleep latencies in the evening and when they woke up in the night. Nightly awakenings were also more common among insomniacs and there were also some differences in the principal causes of

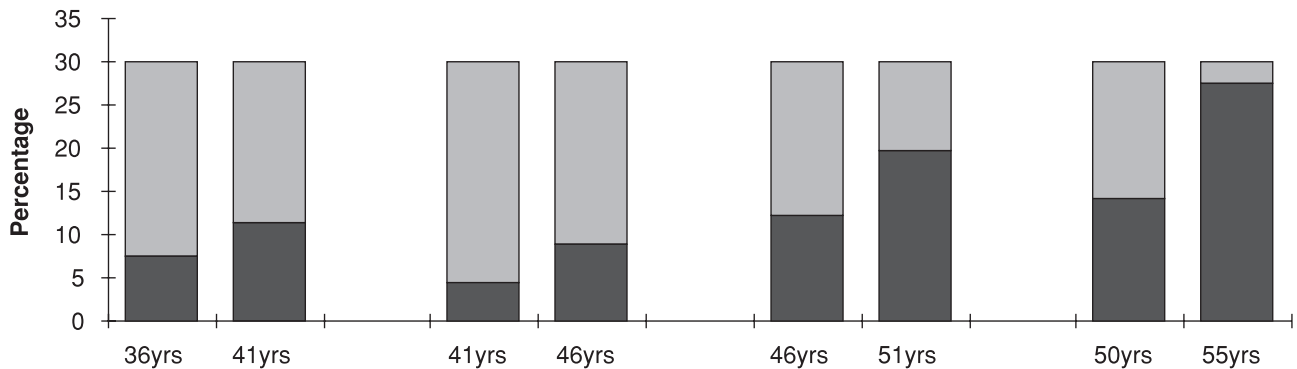


Figure 1. Insomnia at least weekly during past three months at baseline and after 5-year follow-up among women. The age of the group at the time of the survey is shown on the x-axis.

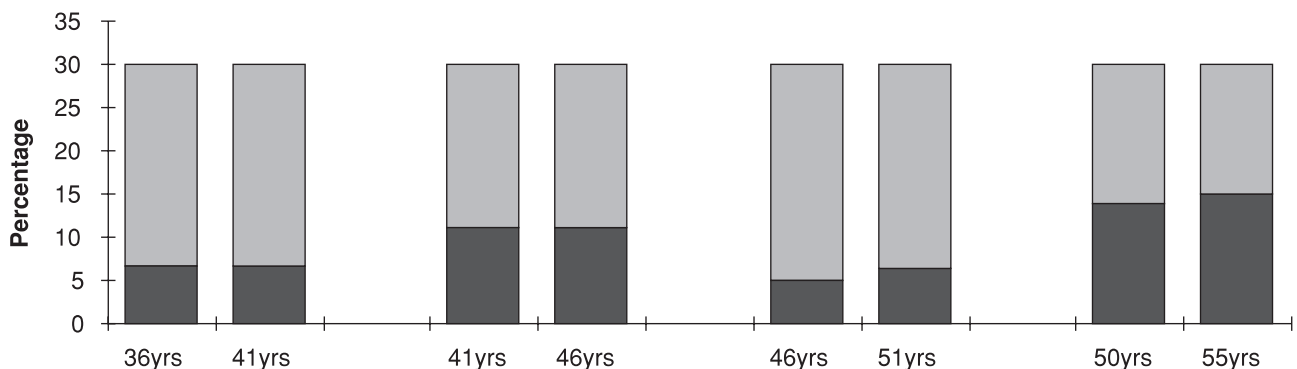


Figure 1. Insomnia at least weekly during past three months at baseline and after 5-year follow-up among men. The age of the group at the time of the survey is shown on the x-axis.

Sleep of the Insomniacs

The percentage of subjects who reported to sleep less than 6.5 hours per night had increased in the whole sample especially among women during the 5-year period: from 3.6% to 7.8% among women and from 5.4% to 6.8% among men. Age was not significantly associated with sleeping time in either gender, but short sleeping time (<6.5h) was more common among insomniacs (OR 2.7, 95% C.I. 1.2-6.2). The reported times of going to bed and waking

awakenings between insomniacs and normal sleepers. When the need of relief was the most common cause of awakening in normal sleepers, worries and pains were the most common causes reported by insomniacs (Table 3).

Leg jerkings were an other typical feature in insomniacs' sleep reported by 9.4 (11.6)% of them vs. 3.4 (3.2)% of normal sleepers, percentages of follow-up survey in parenthesis. As much as 39% of insomniacs rated their quality of sleep bad or rather bad vs. 2% of normal sleepers.

Table 3. The differences in the principal causes of nightly awakenings between insomniacs and normal sleepers

Cause of awakening	OR	(95%CI)
Worries	4.65	2.82-7.63
Pain	1.97	1.18-3.28
Other causes	2.07	1.19-3.62
Other relative than child	2.30	1.15-4.59
Nightmares	1.65	0.89-3.03

OR= odds ratio, CI=confidence interval,

Dependent variable = Insomnia: Goodness of fit chi-square = 73.955, df=89, P=0.874

Categorical variables: nightmares, worries, need of relief, noise, light. children, other relatives, pains, other cause

Table 4. Psychosocial risk factors of insomnia

Term	OR	(95%CI)
Nervousness and tension	2.66	1.50-4.74
Fatigue	2.29	1.32-3.97
Depression	2.58	1.25-5.29
Positivity	0.60	0.35-1.03

OR= odds ratio, CI=confidence interval,

Dependent variable =Insomnia: Goodness of fit chi-square = 41.305, df=34, P=0.182

Categorical variables: Quality of life and Human relationships (unsatisfactory), Depression, Nervousness and tension, Fatigue and Positivity (positive answer)

Insomnia and hypnotics

The reported use of hypnotics was rather low in this middle-aged population. In the first survey 6.4% of women and 3.5% of men had used sometimes sleeping pills during the past three months and five years later the corresponding numbers were 10.2% of women and 5.3% of men. Although insomniacs used more often hypnotics than others ($P<0.001$), even most of them answered that they had not used sleeping pills at all during the past three months. The prevalence of habitual (every or almost every night) consumption of sleep-enhancing medication was 3.3% of women and 7.7% of men with weekly insomnia symptoms in the follow-up survey.

Insomnia and sleepiness

Insomnia was associated with excessive daytime sleepiness in both surveys. Insomniacs regarded themselves as more or clearly more tired than their friends in 32.2% (39.1%) of cases, 17.2% (24.1%) reported daily daytime sleepiness and involuntary tendency to fall

asleep was a weekly problem to 18.7% (20.7%) of insomniacs. Even chronic insomnia does not always cause excessive daytime sleepiness; 30.3% of those who were insomniacs in both surveys had not been sleepy in either survey. Fatigue is a more common problem to insomniacs than unintentional tendency to fall asleep; 65.4% of insomniacs in the follow-up survey had this symptom as compared with 31.5% of normal sleepers ($P<0.001$). Neither acute nor chronic insomnia was associated with increased number of sleepiness-related traffic accidents.

Insomnia and work

The working situation did not differ significantly between insomniacs and normal sleepers in the first survey. Shift-workers were not over-represented among insomniacs in either survey. None of the insomniacs had been reprimanded because of sleepiness at work, but they had more seldom received a more responsible job during the past year: 3.6% vs. 12.4% of normal sleepers ($P=0.016$). At the time of the first survey 93.2% of insomniacs were at work as compared with 94% of other subjects, but after 5-

year follow-up only 83.1% of these insomniacs were still working compared with 91.4% of those who had been normal sleepers at the beginning of the study. Male insomniacs were more often retired at the 5-year follow-up as compared with other men (18.0% vs. 4.7%, $P=0.010$), whereas female insomniacs were more often unemployed (4.6% vs. 0%, $P<0.001$).

Insomnia and quality of life

Insomnia seemed to have a detrimental effect on quality of life: 13.8% of weekly insomniacs were not satisfied with their quality of life in the follow-up survey. Nervousness and tension was significantly associated with all types of insomnia. The associations of psychosocial factors and quality of life with insomnia symptoms, studied by logistic regression modelling, are shown in Table 4.

DISCUSSION

Sleep disturbances as transient phenomena are very common. If the consequences of insomnia are considered, it is important to separate transient insomnia from a long-term or recurrent problem. If more rigorous criteria for the severity and duration of insomnia are used, the prevalence of moderate insomnia seems to be about 10-15% and severe or chronic insomnia 3-10% (5, 14-16). In a study by Ohayon and colleagues (17) the prevalence of insomnia with sleep dissatisfaction in the age-group 45-54 years was 7.1% in males and 13.0% in females. In the present study, when insomnia was defined as a weekly problem during the past three months, the prevalence of insomnia was 9.5% when the age of subjects was between 36 and 50 years and 14% when the mean age was 48.7 years. The prevalence of mild insomnia was 6.4-10.6% and that of severe was 3.1-3.4%. The percentage of subjects who had weekly insomnia also 5 years later was 5.4, almost nightly insomnia had only 0.3% in both surveys. In our study the period of past three months is longer than in most for-

mer studies and represents an already prolonged insomnia problem. Subjects who had the same problem also five years later had chronic or at least recurrent insomnia. The 5-year persistence of weekly insomnia was 57.6% and the persistence of almost nightly insomnia was 40%. In former studies where persistence has been studied, the criteria of insomnia have been different and the prevalences and persistences higher. In the study of Katz and McHorney where the prevalence of mild insomnia was 34% and that of severe 16%, the 2-year persistence of sleep problems was 59% with mild and 83% with severe insomnia (18). In the present study the prevalence of insomnia was higher among women as also in many former studies, but the persistence of the symptom was higher among men. The prevalence did not increase among men with age between 36 and 55 years, but a significant increase in the prevalence of insomnia occurred among women in menopausal age. Menopausal symptoms were not specifically asked in this questionnaire, but they might have been a significant cause of the sleep disturbances reported by women in men- and postmenopausal age.

In the present study the definition of insomnia was not based on the daytime consequences of insomnia but only on the frequency and duration of the sleep disorder. If the severity of insomnia would be determined by its daytime consequences, it would be difficult to decide which type of daytime symptom should be considered to be specifically associated with insomnia. All daytime symptoms associated with insomnia are, however, not consequences of insomnia. In the present study daytime sleepiness evaluated by three different questions was significantly higher among insomniacs than others, but found only in 20-30% of them. Nearly forty percent of insomniacs were not satisfied with their quality of sleep. In some studies the use of sleep-enhancing medication has been used as an additional criterion for insomnia (19), in our study the proportion of insomniacs, who used hypnotics at least occasionally, increased from 22% to 39% when the study population got five years older. Because of the

non-specificity of these symptoms we decided to use only the frequency of the insomnia symptoms as the severity criteria.

The sleep of an insomniac was typically shortened because of more frequent awakenings and longer latencies to fall asleep again. The quality of sleep was poor. These are typical features of insomniacs found also in most former studies. When the main cause of awakening by other subjects was the need of relief, the insomniacs woke up mostly because of worries and anxiety. Also pains and leg jerkings were common causes of sleep disturbances among insomniacs. The main associations with insomnia were nervousness and tension, depression and fatigue, found also in many insomnia studies before. In chronic insomnia the focus of treatment might be in these symptoms and not only in the sleeping time.

Performance deficits have been attributed to transient and persistent insomnia. There are some studies on the association of poor sleep or insomnia with performance at work. These studies do not prove the causality. In a study conducted by the Gallup organization (20) it was found that insomniacs report poor performance at work, memory difficulties and concentration problems. A longitudinal study of Navy personnel found that poor sleepers, as compared to good sleepers, earned fewer pro-

motions and remained at lower pay grades (21). In the study of Lavie insomnia was associated with worse work satisfaction and a loss of productivity (22). Sleeping problems are very common in shift-work. In our study shift-workers were, however, not overrepresented among insomniacs. Change in the working situation may also lead to insomnia. Hyypä and colleagues found that subjects who became unemployed during the economic recession in Finland reported more insomnia and fatigue, slept worse and used more hypnotics than continuously employed (4). In the present study insomniacs were as often employed as normal sleepers at the beginning of the study, but more often without work than normal sleepers after 5-year follow-up: 18% of male insomniacs were retired already before the age of 56 years and 4.6% of female insomniacs were unemployed. It cannot be stated that the cause of their retirement or unemployment had been insomnia, but subjects with long lasting insomnia might have psychosocial or other health problems, which should be solved before they ruin the working capacity. The association of long term insomnia with working capacity has not been sufficiently studied. Both poor sleep and impaired daytime functioning may be consequences of a psychological or physiological dysfunction.

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