

Sleep Problems in White-Collar Male Workers in an Electric Equipment Manufacturing Company in Japan

Akinori NAKATA^{1*}, Takashi HARATANI¹, Norito KAWAKAMI², Akiko MIKI³,
Lumie KURABAYASHI¹ and Hiroyuki SHIMIZU³

¹National Institute of Industrial Health, 6–21–1, Nagao, Tama-ku, Kawasaki 214-8585, Japan

²Department of Public Health, Gifu University School of Medicine, 40 Tsukasa-machi, Gifu 500-8705, Japan

³Department of Adult Nursing, School of Nursing, Miyagi University, 1 Gakuen, Taiwa-cho, Kurokawa-gun, Miyagi 981-3298, Japan

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Abstract: In order to clarify poor sleep habits and prevalence in sleep problems (disturbances) of healthy male white-collar workers and the relationship of these to age and job type, a total of 1,161 Japanese employees of an electric equipment manufacturing company (aged 23 to 59, mean 37 years) were surveyed by means of a mailed questionnaire. The workers were asked about eleven sleep habits. They were also divided into four groups according to age and job type: 23–29 (n=226), 30–39 (n=597), 40–49 (n=225) and 50–59 (n=113); managerial (n=209), professional (n=336), technical (n=475) and clerical (n=134). In this study, the sleep problems were defined as who had at least one of the following four poor sleep habits: 1) taking more than 30 minutes to fall asleep, 2) awakening during sleep (ADS) almost every day, 3) early morning awakening (EMA) almost every day, and 4) excessive daytime sleepiness (EDS) at work almost every day. Analyses showed that sleep problems were present in 26.0% of workers; the problems were most serious among workers aged 50 years and more (36.0%) which may be due to a significant increase in the prevalence rate of EMA. The results revealed that sleep problems are common in male white-collar daytime workers. The findings also suggest a need for increased attention to sleep problems in older workers and younger ones with EDS at work.

Key words: Sleep, Aging, Questionnaires, Prevalence, Epidemiology, Worker, Occupational health

Introduction

It is a well known fact that sleep and health are closely related^{1–3}. In the working population, inadequate sleep could induce not only deterioration of health but could also lead to sleepiness during work which is associated with increased risk of accident at work, absenteeism, low work productivity, and less job satisfaction^{4–8}. Sleep is therefore essential for workers' health and welfare as well as for their safety and productivity in the workplace.

A number of studies have reported sleep problems in shift

workers, and found that the sleep quality of rotating shift workers or permanent night workers is poorer than that of permanent day workers^{3, 9–13}. Studies on sleep in working populations have therefore been mainly focused on low quality of sleep in shift or night workers. Yet, over 70% of the working population of most industrialized countries including Japan are working in daytime¹³, and it has been reported in previous epidemiological studies that about 25–30% of daytime workers have problems with sleep^{4, 14, 16}, indicating that these problems in day workers are also an important occupational health problem. However, only a few studies have investigated the prevalence of sleep problems in daytime working populations^{8, 14–17}, including

*To whom correspondence should be addressed.

two reports from Japan^{14, 15}. One of these reports¹⁴ suggests that the prevalence of sleep problems (27.7%) in Japanese daytime white-collar workers is similar to that reported in studies in other countries^{8, 16}; on the other hand, another study¹⁵ indicated a lower (7.1%) prevalence rate. The conflicting findings suggest a need for further investigation to clarify the reasons for the differences in the prevalence rates as well as factors associated with them. One reason for the differences could be the definition of sleep problems since various definitions were used in previous studies^{8, 14–17}. Moreover, factors such as age and occupation may affect the prevalence of sleep problems. Aging is a well known factor in the disturbance of sleep; a higher prevalence rate of sleep problems in older workers has been observed in previous studies^{8, 14, 17}. And some occupations have been observed to show higher prevalence rates than others¹⁸.

In the present study, to examine further the sleep habits and prevalence of sleep problems, and the relationship of these to age and job type in Japanese white-collar workers, a cross-sectional study was conducted at an electric equipment manufacturing company. Eleven subjective sleep habits were assessed by means of a self-administered questionnaire.

Subjects and Methods

Subjects

A total of 2,625 full-time workers in an electric equipment manufacturing company, aged 18 to 59 were surveyed in April 1997 by means of a mailed self-administered questionnaire on demographic information, sleep characteristics and current job type and schedule. A total of 2,420 (92.2%) workers responded to the survey. Since our primary interest in this study was to determine the prevalence of sleep problems in male white-collar daytime workers, shift workers and blue-collar workers (n=716) were excluded from the analyses; female workers were also excluded because of the skewed distributions in age and job type (n=466). Sixty-eight workers who had a missing response in the questions concerning demographic information and job types were eliminated from the analyses. Nine workers who did not fill out any question in the sleep questionnaire were also eliminated. Finally, a total of 1,161 workers, aged 23 to 59 (mean 37 years) were subjected to the analyses. Workers were divided into four groups according to their age or job type as follows (Table 1): 23–29 (n=226), 30–39 (n=597), 40–49 (n=225) and 50–59 (n=113); managerial (n=209), professional (n=336), technical (n=475) and clerical (n=134). Owing to the quite small population of service

Table 1. Major characteristics of 1,161 male workers of an electric equipment manufacturing company

Characteristic	Total	Percentage
Age, years		
23–29	226	19.5%
30–39	597	51.4%
40–49	225	19.4%
50–59	113	9.7%
Job type		
Managerial	209	18.0%
Professional	336	28.9%
Technical	475	40.9%
Clerical	134	11.5%
Service	7	0.6%

workers (n=7) in this study, they were excluded from the analyses of sleep problems in various job types (Table 5). The present study was carried out with the informed consent of all the workers.

Sleep questionnaire

A self-administered sleep questionnaire was developed for this study and included eleven questions, i.e., daily sleeping hours, time to fall asleep, ADS, EMA, sleeping well at night, sufficiency of sleep, dozing or napping during commuting time or lunch break, EDS at work, absent from or late for work due to oversleeping, use of medication to help sleep, and seeking medical help for sleep problem (Table 2). Each reply was rated on a four to six-point scale. In this study, to determine the healthy workers who suffer from specific poor sleep habits and sleep problems almost every day, we attempted to dichotomize each sleep habit question and set a criterion response as in Tables 4 and 5. Sleep problems were defined as workers who had at least one of the following four poor sleep habits: 1) taking more than 30 minutes to fall asleep, 2) awakening during sleep (ADS) almost every day, 3) early morning awakening (EMA) almost every day, and 4) excessive daytime sleepiness (EDS) at work almost every day.

Statistical analysis

Differences in the data of reported hours on sleep by 10-year age groups and ages of workers in each job type were tested by one-way analysis of variance (ANOVA). Prevalence data were computed as the proportion of workers exceeding a criterion level of each questionnaire item (Tables 4 and 5). The χ^2 test was performed to analyze differences

Table 2. Sleep questions

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1. On the average, how much sleep per day did you usually take during the last year?
(1) less than 5 hours (2) 6 hours (3) 7 hours (4) 8 hours (5) 9 hours (6) 10+ hours
 2. How long does it usually take you to fall asleep in bed?
(1) 0–10 minutes (2) 11–30 minutes (3) 31–59 minutes (4) 1–2 hours (5) 2+ hours
 3. How often do you have difficulty staying asleep?
(1) never (or almost never) (2) few times a year (3) more than once a month
(4) more than once a week (5) almost every day
 4. How often do you wake up too early and can't fall asleep again?
(1) never (or almost never) (2) few times a year (3) more than once a month
(4) more than once a week (5) almost every day
 5. Do you usually sleep well at night?
(1) very well (2) fairly well (3) not so well (4) very poorly
 6. How often do you take a nap while commuting time or during lunch break?
(1) never (or almost never) (2) few times a year (3) more than once a month (4) more than once a week (5) almost every day
 7. Do you think your daily sleep is sufficient?
(1) very much sufficient (2) fairly sufficient (3) somewhat insufficient (4) definitely insufficient
 8. How often do you feel very drowsy when you are at work?
(1) never (or almost never) (2) few times a year (3) more than once a month (4) more than once a week (5) almost every day
 9. How often were you late from or absent for work due to oversleeping in the last year?
(1) never (2) 1–3 times (3) 4–6 times (4) 7–11 times (5) 12+ times
 10. How often did you use tranquilizers or other sleeping drugs to help you sleep within the last year?
(1) never (2) 1–9 times (3) 10+ times (4) more than once a week (5) almost every day
 11. Do you have any sleep problems or have you sought medical help (doctor or nurse) for sleep problems within the last year?
(1) no, never (2) I have a little bit of trouble but haven't sought medical help (3) I have a serious trouble but haven't sought medical help (4) I have sought medical help for sleep problems
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Table 3. Reported hours of sleep as a percentage of each age groups in 1,161 male workers

Age group	N	Reported hours of sleep					Average hours (SD) ^a
		5	6	7	8	9	
23–29	226	1.8	36.3	53.1	8.0	0.9	6.70 (0.68)
30–39	597	3.0	34.5	49.4	12.4	0.7	6.73 (0.74)
40–49	225	4.0	37.8	44.9	13.3	0.0	6.68 (0.75)
50–59	113	1.8	41.6	46.0	8.8	1.8	6.67 (0.73)
Total	1161	2.8	36.2	48.9	11.4	0.7	6.71 (0.73)

^aNo significant differences were found in age groups.

in sleep variables of age groups and job types; the Kendall's τ_b rank correlation coefficients were calculated to examine the relationships between age groups and sleep variables. The significance level of all statistical analyses was set at a probability of less than 0.05 (two-tailed test). All data in this study were analyzed by means of the Statistical Package for the Social Sciences version 6.1 (SPSS Inc., Chicago, U.S.A).

Results

Table 3 shows reported hours of sleep by age. No significant differences in daily sleeping hours were found. The average length of sleep was 6.7 hours for all the workers; the 30–39 year age group was the highest and the 50–59 year age group was the lowest. Tables 4 and 5 show the prevalence of sleep habits exceeding criterion levels by age

Table 4. Poor sleep habits and the prevalence of sleep problems as a percentage of each age group in 1161 male workers

Questions	Criterion response	Age groups					^a p	^b τ_b
		23–29 n=225-226	30–39 n=593-597	40–49 n=222-225	50–59 n=113	Total n=1154-1161		
Sleep habits:								
Time to fall asleep	Over 30 minutes	12.4	11.9	7.1	14.0	11.3		-.025
Awakening during sleep (ADS)	Almost every day	10.6	15.8	10.2	20.2	14.1	p<.05	.027
Early morning awakening (EMA)	Almost every day	0.9	1.7	1.8	6.1	2.0	p<.01	.067 [#]
Sleep well at night	Very poorly	1.3	0.8	0.9	0.0	0.9		-.028
Dozing or napping in daytime	Almost everyday	1.3	2.2	0.4	2.6	1.7		-.00
Sufficiency of sleep	Definitely insufficient	7.1	8.7	6.3	2.6	7.3		-.039
Excessive daytime sleepiness (EDS) at work	Almost every day	6.2	2.7	2.2	3.5	3.4		-.052
Being absent from or late for work due to oversleeping	More than 12 times a year	0.9	1.7	0.0	0.0	1.0		-.038 [#]
Use of medication to help sleep	Almost every day	0.4	0.8	1.3	0.9	0.9		.023
Sought medical help for sleep problem	Yes	1.8	1.5	1.4	2.6	1.6		.001
^c Sleep problems	Present	25.7	26.4	20.1	36.0	26.0	p<.05	.008

^a χ^2 -test among age groups. ^bKendall's τ_b rank correlation coefficients #p<.05. ^cThe sleep problems were defined as who had at least one of following four poor sleep habits: 1) taking more than 30 minutes to fall asleep, 2) ADS almost every day, 3) EMA almost every day, and 4) EDS almost every day.

Table 5. Poor sleep habits and the prevalence of sleep problems as a percentage of each job type in 1154 male workers

Questions	Criterion response	Job types					P
		Managerial n=206-208	Professional N=334-336	Technical n=473-475	Clerical n=134	Total n=1147-1154	
Mean ages (SD)		48.1 (5.8)	34.2 (5.8)	33.0 (5.7)	38.8 (8.9)	36.8 (8.3)	^a p<.001
Sleep habits:							
Time to fall asleep	Over 30 minutes	8.7	11.0	12.8	9.7	11.3	
Awakening during sleep (ADS)	Almost every day	15.4	13.7	13.7	14.2	14.1	
Early morning awakening (EMA)	Almost every day	2.9	1.2	2.1	2.2	2.0	
Sleep well at night	Very poorly	1.0	0.9	0.8	0.7	0.9	
Dozing or napping in daytime	Almost every day	1.4	2.7	1.5	0.7	1.7	
Sufficiency of sleep	Definitely insufficient	7.2	8.7	8.0	1.5	7.3	^b p<.05
Excessive daytime sleepiness (EDS) at work	Almost every day	3.8	3.0	4.2	0.7	3.4	
Being absent from or late for work due to oversleeping	More than 12 times a year	0.0	1.8	1.3	0.0	1.0	
Use of medication to help sleep	Almost every day	1.0	1.2	0.6	2.2	0.9	
Sought medical help for sleep problem	Yes	2.4	1.2	1.3	3.0	1.6	
^c Sleep problems	Present	28.4	24.1	27.0	22.4	26.0	

^aOne-way ANOVA. ^b χ^2 -test among job types. ^cThe sleep problems were defined as in Table 4.

group and job type; prevalence of sleep problems is also shown in the same table. Significant age differences were found in the prevalence of ADS, EMA, and sleep problems; and a significant job type difference was found in the prevalence of definite insufficiency of sleep.

Age groups were positively and significantly correlated with the prevalence of EMA (Fig. 1), and inversely correlated with the frequency of being absent from or late for work due to oversleeping. As shown in Table 4 and Figure 1, the

prevalence of sleep problems was between 20 and 27% in the 23–29, 30–39, and 40–49 age groups, but the rate exceeded 36% in the 50–59 age group. In contrast, the prevalence of EDS at work was higher in younger workers than in older ones.

Discussion

This study demonstrates that the sleep problems are

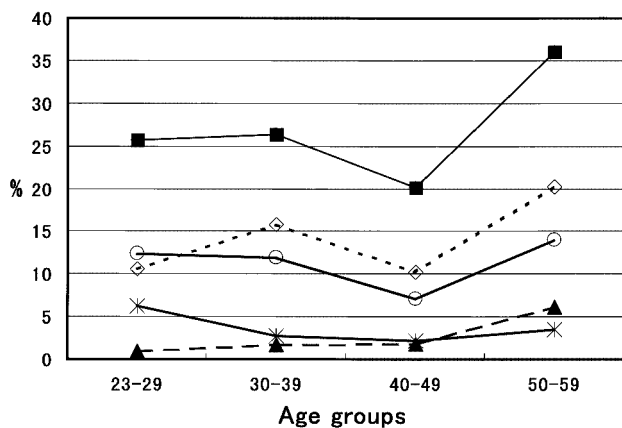


Fig. 1. Percentages of 1) taking more than 30 minutes to fall asleep (), 2) early morning awakening almost every day (), 2) awakening during sleep almost every day (), 4) excessive daytime sleepiness at work almost every day (*), and 5) any of four specific poor sleep habits () as a percentage of each age groups in 1,161 male workers.

Number of workers: 226 for 20–29; 597 for 30–39; 225 for 40–49; 113 for 50–59.

common in male white-collar workers in an electric equipment manufacturing company, as reported in the previous studies^{8, 14–17}. Overall 26.0% of the workers responded that they had at least one of four specific poor sleep habits (taking more than 30 minutes to fall asleep, ADS almost every day, EMA almost every day, or EDS at work almost every day) in the last year (Table 4).

The prevalence of sleep problems in male workers was similar to that reported in Japanese daytime white-collar workers¹⁴) (27.7%), as well as to that in two studies on daytime workers in Western countries^{8, 16}) (28.2% and 25.8%, respectively). It was higher than the prevalence reported by one Western study (15.8%)¹⁷) and one Japanese (7.1%)¹⁵) study. The differences in the rates among these studies might be attributable to the definition of sleep problems (disturbances). Some studies used a single item to define it^{15–17}). For example, Jacquinet-Salord *et al.*¹⁷) assessed sleep disturbances by asking “Do you sleep well without sleeping tablets?” This question may overlook the workers who have sleep problems without using sleeping tablets which could lead to a lower prevalence rate. Also, Kuppermann *et al.*¹⁶) asked whether the workers ‘now’ had problems with sleep. Motohashi *et al.*¹⁵) inquired whether the workers ‘always’ had symptoms of sleep disturbance; the prevalence of workers who ‘always’ have sleep disturbances was 7.1% whereas ‘often’ was 37.0%. Such adopting a single item could possibly induce a wide gap in prevalence rates since it could

be affected by the condition of the items. And as a result, it would lead to a difficulty in comparing the prevalence rates among studies. On the other hand, Lavie⁸) defined sleep disturbances as difficulty in falling asleep, ADS and/or EDS. Tachibana *et al.*¹⁴) defined it as workers troubled with any of following three sleep complaints, i.e., difficulty in falling asleep, ADS and EMA in the previous month. A combination of three different complaints were used to define sleep problems (disturbances) in these two studies^{8, 14}). An advantage in defining sleep problems by a combination of different items is that the items are based on specific and concrete sleep habits. If the workers were merely asked ‘Do you have sleep problems or not?’, some of them without subjective symptoms might be overlooked since it depends on the worker’s subjective feeling of having sleep problems or not. In the current study, we considered sleep problems as having any of four specific poor sleep habits; these habits were selected on the basis of the fact that not only nighttime sleep but also daytime sleepiness at work are considered as a serious occupational health problem^{4–8}). Although further studies are needed to define the sleep problems in epidemiological studies, the results showed that one of four daytime white-collar workers suffer from sleep problems in this study.

The prevalence of sleep problems was highest among the workers aged 50 years and more (Table 4, Fig. 1). Our finding of more frequent sleep problems in older workers agrees with the previous findings^{8, 14, 16, 17}). Tachibana *et al.*¹⁴) found significant increases in difficulty in falling asleep, midsleep awakening (awakening during sleep) and EMA with advancing age; prevalence of insomniac workers was 3 times higher in the older workers (42.3%) than in the younger ones (13.5%). Lavie⁸) showed that male industrial workers had a significant age trend in midsleep awakening, with a 4-fold increase in complaints from 5% at years 18–24 to more than 20% at 55 years and more. Jacquinet-Salord *et al.*¹⁷) also found a significant positive relationship between age and the prevalence of sleep disturbances which had no relation to the differences in physical working conditions; the disturbances were particularly frequent at ages over 55 years. The present and these previous findings suggest that ages 50–55 years appear to be a critical point for sleep problems in male workers which could be attributable to combined increases in difficulty falling asleep, EMA and/or ADS with age. A possible explanation for an acute increase in sleep disturbances in older workers is that pathological changes occur with advancing age; it has been reported that sleep-related breathing disturbances, periodic limb movement

disorder during sleep, coexisting medical problems, and degenerative central nervous system changes significantly influence the sleep of older adults¹⁹⁻²²). And in a recent study, depressed mood of older adults was pointed out as a factor in disturbing sleep²³). Thus much attention should be paid to sleep disturbances in workers over 50 years of age because such changes could contribute to the disturbances.

No significant relationships were found between age groups and the prevalence of using medication to help sleep or seeking medical help for sleep problem. However, in the 50–59 year age group, workers who used medication to help sleep almost every night (2.7%) was about twice as high as in other age groups. Jacquinet-Salord *et al.*¹⁷) found significant age associated increases in sleeping tablet consumption; workers over 55 years of age exceeded 7.0% which was more than three times higher than for workers under 54 years. Similarly, workers who sought medical help for sleep problems were higher in the 50–59 year age group in this study. These results suggest that the quality of nighttime sleep of older workers is lower than in younger ones. Further studies are required to confirm these relations.

Age groups were inversely and significantly correlated with frequency of being absent from or late for work due to oversleeping. In the current study, prevalence was highest in the 30–39 year age group (1.7%) and the 20–29 year age group was next (0.9%). No workers in the 40–49 and 50–59 years age groups responded that they had been absent from or late for work due to oversleeping in the last year. Reasons for being absent or late from work for oversleeping in relation to sleep habits should be explored in the future study.

Another finding in younger workers was that the prevalence of EDS at work was higher in the 23–29 age group than in the other age groups though not statistically significant. The results of the current study suggest that EDS at work occurs more often in younger workers but some different findings have been obtained in previous studies concerning the relationship between age and EDS²⁴⁻²⁷). Bixler *et al.*²⁴) found a significantly higher prevalence of EDS in the 18 to 30 year old group than in the 31 to 50 year and 51 to 80 year old groups. Lugaesi *et al.*²⁵) also found similar results in the 10 to 19 year old group. In contrast, Klink *et al.*²⁶) and Partinen *et al.*²⁷) found that EDS increased with age. In a working population, Lavie⁸) found no association between age and the prevalence of EDS. It could be considered from these results that factors other than age might affect EDS. A recent study reported that life style factors such as physical activity and alcohol consumption have a

significant effect on daytime sleepiness in shift workers²⁸). Although the factors affecting EDS have not been fully clarified, the evidence that workers with EDS at work have a higher prevalence of work accidents⁸) suggests the need for an increased attention to such workers. Future studies should explore factors affecting EDS at work in more detail.

No significant differences in sleep variables among job types except for definite insufficiency of sleep were found in the current study (Table 5). The prevalence of definite insufficiency of sleep in clerical workers was 1.5% whereas for other job types it was between 7.2% and 8.7%. The results suggest that the prevalence of poor sleep habits are mainly associated with age but not with job type. However, it has been reported that occupations such as those of bus drivers, teachers, laborers, gardeners and construction workers have a higher prevalence of insomnia than directors, physicians and electricians¹⁸). It could be hypothesized from these studies that differences in occupations rather than job types might affect prevalence of sleep problems. Further research concerning the relationship between occupational factors and sleep problems is needed.

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