Table 3 Association between insomnia or insomnia comorbid with depression and each factor of stress coping behaviors and sleep hygiene practices

	Insomnia (n = 10653)					Insomnia comorbid with depression (n = 1357)				
		Crude		Adjusted†			Crude		Adjusted†	
	N	OR	95%CI	OR	95%CI	N	OR	95%CI	OR	95%CI
Stress coping behaviors (SCB)										
Bearing the stress without taking any action (Bearing)	1576	1.97	1.78–2.18	1.69	1.52–1.88	378	3.49	2.96–4.10	3.44	2.92–4.05
Smoking (Smoking)	1954	1.22	1.12–1.33	1.26	1.15–1.38	317	1.48	1.24–1.76	1.73	1.44–2.08
Eating something (Eating)	1663	1.27	1.16–1.39	1.22	1.11–1.34	273	1.58	1.33–1.88	1.51	1.26–1.81
Watching TV/Listening to radio (TV/ Radio)	3650	1.26	1.17–1.35	1.18	1.10–1.27	537	1.57	1.35–1.83	1.52	1.30–1.78
Making an effort to solve problems actively (Problem solving)	1609	0.88	0.80–0.96	0.87	0.80–0.95	121	0.50	0.39–0.64	0.50	0.39–0.65
Taking it easy (Ease)	3630	*n.s.*	–	*n.s.*	–	354	0.72	0.61–0.85	0.74	0.63–0.87
Making plans to take time off (Time off)	734	*n.s.*	–	*n.s.*	–	65	*n.s.*	–	*n.s.*	–
Sleep hygiene practices (SHP)										
Drinking alcohol (Alcohol)	2961	1.24	1.15–1.34	1.27	1.18–1.38	349	*n.s.*	–	*n.s.*	–
Reading books/Listening to music (Books/ Music)	3747	1.20	1.12–1.29	1.24	1.15–1.33	460	1.36	1.16–1.59	1.39	1.19–1.63
Taking a bath (Bath)	4983	1.13	1.05–1.21	1.09	1.01–1.17	587	*n.s.*	–	*n.s.*	–
Trying to have regular daily habits (Regularity)	4114	*n.s.*	–	*n.s.*	–	420	0.69	0.59–0.80	0.64	0.55–0.75
Taking light exercise (Exercise)	2174	*n.s.*	–	*n.s.*	–	239	*n.s.*	–	*n.s.*	–

†Adjusted for sex, age, and presence of stress by multiple logistic regression analyses. CI, confidence interval; Crude, non-adjustment; OR, odds ratio ($P < 0.01$).

DISCUSSION

We found a fairly high prevalence of insomnia (43.4%) as defined in this study in the general Japanese population. Although previous studies have pointed out that Japanese people tend to underreport their sleep problems because of cultural reticence compared with those in Western cultures,[3] our results did not necessarily align with these studies. One previous study based on a sample of 3030 Japanese reported that 21.4% of the general population suffered "always" or "often" from insomnia.[48] Stewart *et al.* have shown the prevalence of insomnia symptoms/syndromes differs dramatically when different definitions of insomnia are applied.[49] More than 50 large-scale surveys have examined the prevalence of insomnia, but variations in the rates are attributable to differences in methodology and confusion over the standardized definitions of insomnia used.[1–5,49]

Possible reasons for the higher prevalence of insomnia obtained in our study include the following. First, following the ICSD-2 criteria, an item on nonrestorative sleep was added to our definition of insomnia. Secondly, our sample may have included cases with short-term insomnia occurring in less than the past one month (e.g. adjustment insomnia) in the absence of specifications on

the duration and frequency of insomnia symptoms. The case definition of insomnia based partially on the ICSD-2 and DSM-IV was more liberal than the original definitions of the disorder. Lastly, the greatest factor responsible for our higher prevalence rate was the inadequate assessment of daytime impairments associated with insomnia. It is possible that the complaints from participants were related to physical or psychological problems, which are separate issues from insomnia. However, as some studies have indicated,[9,10] and to the extent of our knowledge, there is no validated self-reporting tool about which researchers are in consensus for accurately measuring daytime impairments due to insomnia.

The presence of insomnia comorbid with depression was 5.5% (n = 1357), with a rate of 12.7% among the sample of people with insomnia. Ford *et al.* reported 14.0% as a prevalence of insomnia co-occurring with depression in a study based on 7954 American households.[22] Vollarath *et al.* state that insomnia constitutes an independent syndrome,[24] and Buysse *et al.* suggest that insomnia and depression are commonly comorbid, and insomnia comorbid with depression is an important intermediate phenotype.[25] Our study is the first to find that the frequency of insomnia comorbid with depression observed in Western countries is stable in Japanese adults as well (approximately one seventh of the population).

SCBs among people with insomnia

As far as we know, this is the first report that investigates stress-coping behaviors among people with insomnia in the general adult population. According to Lazarus and Folkman,[50] coping behavior refers to cognitive and behavioral efforts to manage external and internal demands. There are two types of coping behaviors: problem-focused and emotion-focused behaviors.[51] With regards to the coping behaviors among people with insomnia, Morin *et al.*[37] indicate that, compared with good sleepers, people with insomnia are apt to perceive their lifestyle as more stressful and choose more emotion-focused coping behaviors. This does not contradict reports indicating that people with insomnia tend to internalize stress, affecting emotions.[8,35–39] Similar trends were observed in the sample of people with insomnia in the present study. Our multivariable logistic regression analysis revealed that, among the seven SCBs, insomnia was positively related to the emotion-focused coping behaviors of bearing, smoking, eating, and TV/radio. Bearing had the strongest positive correlation with insomnia (OR = 1.69), and an even stronger correlation with insomnia comorbid with depression (OR = 3.44). Therefore, our study indicates that problem-focused behaviors represented by Problem-solving could be helpful in overcoming insomnia.

While Ease was not significantly related to insomnia, it had a significant relation with insomnia comorbid with depression (OR = 0.74). This indicates that people with insomnia may not necessarily engage in the same stress-coping behavior as insomniacs comorbid with depression. The present findings indicate that novel therapeutic strategies need to be developed, taking into account both characteristics of insomnia and depression.

This study further revealed a strong positive association between Smoking and insomnia (OR = 1.26). Previous research in Europe and in the United States indicates a relationship between nicotine consumption through smoking and poor sleep quality.[34,52–54] Furthermore, the strong association between Smoking and insomnia comorbid with depression (OR = 1.73) indicates that individuals with insomnia comorbid with depression tend to rely on more unhealthy coping strategies in their daily life. Our results might highlight the importance of strongly urging people complaining of insomnia to quit smoking.[24,33,34]

Eating was significantly related to insomnia. A previous epidemiological study reported that irregular eating habits and subjective sleep insufficiency were closely associated.[55] TV/Radio is also significantly related to insomnia. Morin *et al.* indicated that many individuals initiate a variety of self-help strategies to alleviate insomnia, including listening to music and relaxation.[2] In fact, these individuals may experiment with a variety of these passive emotional focused self-help remedies for a considerable period of time before seeking professional help.

SHPs among people with insomnia

There have been several studies that have shown that individuals with insomnia often engage in some inappropriate sleep practices. In a population-based sample of 258 insomniacs, Jefferson *et al.*[34] reported that, compared with healthy people, insomniacs more habitually drank alcohol before going to bed. Our study also demonstrated that alcohol consumption before going to bed is positively related to insomnia. Research in the United States suggests that drinking alcohol is an important risk factor for sleep problems.[56] In their comparison of sleep habits among people in ten different countries, Soldatos *et al.* found that Japan ranked the highest in terms of the prevalence of alcohol use as a sleep aid (30.3%).[57] Thus,

it is critical to provide sleep hygiene education about minimizing alcohol consumption before bedtime to people with insomnia.

Our analysis further found that Books/Music was also positively related to insomnia. Some previous studies have reported that reading behavior is significantly more frequent among groups with insomnia than control groups.[2,35,58] Morin *et al.* found in their epidemiological survey of a general population in Canada that insomnia syndrome sufferers use music (OR = 2.6) and reading (OR = 1.8) as self-help strategies to facilitate sleeping.[2] In our study, combining Books and Music into one item in the questionnaire may have comparatively reduced the odds ratio.

One epidemiological study among Japanese indicates that poor exercise habits are associated with insomnia.[48] Based on this finding, we hypothesized that physical activity would be an inhibiting factor for insomnia symptoms; however, there was no significant relationship between Exercise and insomnia. Previous research suggests that daytime physical activity improves sleep.[58,59] The inconsistency in the findings might be attributable to the lack of information available regarding the type (level), duration, and frequency of physical activity in our study.

While Bath was slightly related to insomnia, it had no significant association with insomnia comorbid with depression. Subjective sleep sufficiency is better for individuals when they take a bath before going to bed rather than when they do not.[60] Taken together, these observations may indicate that taking a bath improves the subjective quality of comorbid depression.

By contrast with previous studies,[61,62] our analysis found no significant association between Regularity and insomnia. This may be attributable to the fact that we did not define the behaviors belonging to this SHP in a concrete manner. Regular exposure to photic and nonphotic time cues (Zeitgebers) for the circadian clock system supposedly stabilizes the acrophases of the sleep–wake rhythm as well as the physiological rhythm, allowing one to fall asleep and maintain sleep more easily. The strong negative association between Regularity and insomnia comorbid with depression (OR = 0.64) found in the present study supports a treatment emphasis on regularity for mood disorders including bipolar disorder.[63]

Study limitations

We recognize several limitations of this research. Firstly, due to the cross-sectional survey design, the study is unable to establish a direct causal relationship between insomnia and SCBs and SHPs. This study also lacked analysis on the socioeconomic background of participants. This is an essential defect of the study because sleep behaviors are markedly affected by this component. However, the main purpose of this study was not to conclude that SCBs and SHPs in daily life cause or are caused by insomnia, not to investigate socioeconomic background, but rather to examine the psychobehavioral characteristics of people with insomnia based on a large representative sample of the general population, and this purpose was achieved. Secondly, people with insomnia in the present study were identified only by a subjective assessment via a self-administered questionnaire; they were not diagnosed by objective measures such as polysomnography and actigraphy. Since it was a large-scale survey of the general population, subjective responses were not obtained via a rigorous methodology (e.g. a structured interview). For this reason, the definition of insomnia in the study might include other sleep disorders that occur less frequently than insomnia but are observed across a wide range of ages, such as parasomnia and circadian rhythm sleep disorder. Indeed, many physical and other psychiatric problems (schizophrenia, affective disorder and chronic pain, etc.) still included in the study may cause insomnia. Identifying cases with insomnia meeting the general criteria of the ICSD-2 or DSM-IV in a finer-grained manner to claim a prevalence figure not only requires a self-report survey, but also a structured interview and polysomnography. Thus, the prevalence figure in this study is of very limited value, since the case definition of insomnia does not fulfill the frequency, severity and duration criteria. Such data collection for more rigorous epidemiological study would incur an enormous cost. Lastly, as our previous reports have also suggested,[46,55] the stress coping behaviors and sleep hygiene practices defined in this study were not clearly distinguished and selected properties. As a result, it is unknown whether the characteristics of the Japanese population-based sample of people with insomnia will generalize to those of clinically referred people with insomnia.

To date, individuals still underreport possible sleep problems and are unlikely to be receiving proper treatment.[2,3,32,36,64] Many of the participants with insomnia as described in this study are likely those who are in the "preinsomnia" moment,[28] and do not consider themselves insomniacs. They may be characterized by vulnerabilities in how they perceive and experience stressful life events negatively.[28,29,37] Most are not seeking help,[2,6,64] and possibly they will continue to engage in

self-help maladaptive practices, such as substance abuse, until they are finally diagnosed with chronic insomnia or depression.[2,24,35,39] This study mainly targeted adults, but future research needs to examine SCBs and SHPs among minors,[65] as well as study the onset of insomnia and its temporal development into chronic insomnia.[25,28–30,66]

CONCLUSION

We found that the presence of insomnia among Japanese was as high as 43.4% and that insomnia comorbid with depression occurred at a fixed frequency of 12.7% (approximately one seventh) of this general sample. Among the SCBs that people with insomnia use in daily life, emotion-focused coping behaviors such as bearing and smoking may act as precipitating or perpetuating factors for insomnia. With regard to SHPs, we found several distinguishing self-help behaviors among the participants. These findings may offer critical insights for developing effective sleep educational preventative programs.

ACKNOWLEDGEMENTS

This study was supported by a Health Science Research Grant from the Ministry of Health, Labour and Welfare. The authors report no other financial affiliation or relationship relevant to the subject of this article.

REFERENCES

1 Ohayon MM. Epidemiology of insomnia: what we know and what we still need to learn. *Sleep Med. Rev.* 2002; **6**: 97–111.
2 Morin CM, Leblanc M, Daley M, Gregoire JP, Merette C. Epidemiology of insomnia: prevalence, self-help treatments, consultations, and determinants of help-seeking behaviors. *Sleep Med.* 2006; **7**: 123–30.
3 Leger D, Poursain B, Neubauer D, Uchiyama M. An international survey of sleeping problems in the general population. *Curr. Med. Res. Opin.* 2008; **24**: 307–17.
4 Leger D, Gilleminault C, Dreyfus JP, Delahaye C, Pallard M. Prevalence of insomnia in a survey of 12 778 adults in France. *J. Sleep Res.* 2000; **9**: 35–42.
5 National Institutes of Health. National Institutes of Health state of the science conference statement on manifestations and management of chronic insomnia in adults, June 13–15, 2005. *Sleep* 2005; **28**: 1049–57.
6 Buysse DJ. Chronic insomnia. *Am. J. Psychiatry* 2008; **165**: 678–86.
7 Bonnet MH, Arand DL. 24-Hour metabolic rate in insomniacs and matched normal sleepers. *Sleep* 1995; **18**: 581–8.
8 Basta M, Chrousos GP, Vela-Bueno A, Vgontzas AN. Chronic insomnia and stress system. *Sleep Med. Clin.* 2007; **2**: 279–91.
9 Leger D, Scheuermaier K, Philip P, Paillard M, Guilleminault C. SF-36: evaluation of quality of life in severe and mild insomniacs compared with good sleepers. *Psychosom. Med.* 2001; **3**: 49–55.
10 Ohayon MM, Lemoine P. Daytime consequences of insomnia complaints in the French general population. L'Encéphale 2004; 222–7.
11 Leger D, Guilleminault C, Bader G, Levy E, Paillard M. Medical and socio-professional impact of insomnia. *Sleep* 2002; **5**: 625–9.
12 Daley M, Morin CM, LeBlanc M, Grégoire JP, Savard J. The economic burden of insomnia: direct and indirect costs for individuals with insomnia syndrome, insomnia symptoms, and good sleepers. *Sleep* 2009; **32**: 55–64.
13 Sivertsen B, Overland S, Neckelmann D *et al.* The long-term effect of insomnia on work disability: the HUNT-2 historical cohort study. *Am. J. Epidemiol.* 2006; **163**: 1018–24.
14 Ozminkowski RJ, Shaohung SW, Walsh JK. The direct and indirect costs of untreated insomnia in adults in the United States. *Sleep* 2007; **30**: 263–73.
15 Simon GE, VonKorff M. Prevalence, burden, and treatment of insomnia in primary care. *Am. J. Psychiatry* 1997; **154**: 1417–23.
16 Ohayon MM, Smirne S. Prevalence and consequences of insomnia disorders in the general population of Italy. *Sleep Med.* 2002; **3**: 115–20.
17 Mellinger GD, Balter MB, Uhlenhuth EH. Insomnia and its treatment. Prevalence and correlates. *Arch. Gen. Psychiatry* 1985; **42**: 225–32.
18 Soldatos CR. Insomnia in relation to depression and anxiety: epidemiologic considerations. *J. Psychosom. Res.* 1994; **38** (Suppl 1): 3–8.
19 Taylor DJ, Lichstein KL, Durrence HH, Reidel BW, Bush AJ. Epidemiology of insomnia, depression, and anxiety. *Sleep* 2005; **28**: 1457–64.
20 Tsuno N, Besset A, Ritchie K. Sleep and depression. *Clin. Psychiatry* 2005; **66**: 1254–69.
21 Jindal RD, Buysse DJ, Thase ME. Maintenance treatment of insomnia: what can we learn from the depression literature? *Am. J. Psychiatry* 2004; **161**: 19–24.
22 Ford DE, Kamerow DB. Epidemiologic study of sleep disturbances and psychiatric disorders: an opportunity for prevention? *JAMA* 1989; **262**: 1479–84.
23 Foley DJ, Monjan AA, Izmirlian G, Hays JC, Blazer DG. Incidence and remission of insomnia among elderly adults in a biracial cohort. *Sleep* 1999; **22**: S373–78.
24 Vollath M, Wicki W, Angst J. The Zurich Study VIII. Insomnia: association with depression, anxiety, somatic

symptoms, and course of insomnia. *Eur. Arch. Psychiatry Neurol. Sci.* 1989; **239**: 113–24.
25 Buysse DJ, Angst J, Gamma A, Ajdacic V, Eich D, Rössler W. Prevalence, course, and comorbidity of insomnia and depression in young adults. *Sleep* 2008; **31**: 473–80.
26 Pigeon WR, Hegel M, Unützer J *et al.* Is insomnia a perpetuating factor for late-life depression in the IMPACT cohort? *Sleep* 2008; **31**: 481–8.
27 Riemann D, Voderholzer U. Primary insomnia: a risk factor to develop depression? *J. Affect. Disord.* 2003; **76**: 255–9.
28 Bastien CH, Vallières A, Morin CM. Precipitating factors of insomnia. *Behav. Sleep Med.* 2004; **2**: 50–62.
29 Healy ES, Kales A, Monroe LJ *et al.* Onset of insomnia: role of life-stress events. *Psychosom. Med.* 1981; **43**: 439–51.
30 LeBlanc M, Mérette C, Savard J, Ivers H, Baillargeon L, Morin CM. Incidence and risk factors of insomnia in a population-based sample. *Sleep* 2009; **32**: 1027–37.
31 Spielman AJ, Caruso LS, Glovinsky PB. A behavioral perspective on insomnia treatment. *Psychiatr. Clin. North Am.* 1987; **10**: 541–53.
32 LeBlanc M, Beaulieu-Bonneau S, Mérette C, Savard J, Ivers H, Morin CM. Psychological and health-related quality of life factors associated with insomnia in a population-based sample. *J. Psychosom. Res.* 2007; **63**: 157–66.
33 Morin CM, Espie C. *Insomnia: A Clinical Guide to Assessment and Treatment.* Springer: New York, 2004.
34 Jefferson CD, Drake CL, Scofield HM *et al.* Sleep hygiene practices in a population-based sample of insomniacs. *Sleep* 2005; **28**: 611–5.
35 Kales JD, Kales A, Bixler EO *et al.* Biopsychobehavioral correlates of insomnia. V. Clinical characteristics and behavioral correlates. *Am. J. Psychiatry* 1984; **141**: 1371–6.
36 Angst J, Vollrath M, Koch R, Dobler-Mikola A. The Zurich Study VII. Insomnia: symptoms, classification and prevalence. *Eur. Arch. Psychiatry Neurol. Sci.* 1989; **238**: 285–93.
37 Morin CM, Rodrigue S, Ivers H. Role of stress, arousal, and coping skills in primary insomnia. *Psychosom. Med.* 2003; **65**: 259–67.
38 Kales A, Caldwell AB, Preston TA, Healey S, Kales JD. Personality patterns in insomnia: theoretical implications. *Arch. Gen. Psychiatry* 1976; **33**: 1128–4.
39 Kales A, Caldwell A, Soldatos CR, Bixler EO, Kales J. Biopsychobehavioral correlates of insomnia. II. Pattern specificity and consistency with the Minnesota Multiphasic Personality Inventory. *Psychosom. Med.* 1983; **45**: 341–56.
40 Schneider-Helmert D. Twenty-four-hour sleep-wake function and personality patterns in chronic insomniacs and healthy controls. *Sleep* 1987; **10**: 452–62.
41 Shima S, Shikano T, Kitamura T. A new self-rating scale for depression. *Clin. Psychiatry* [Japanese] 1985; **27**: 717–23.
42 Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Appl. Psychol. Meas.* 1977; **1**: 385–401.
43 American Academy of Sleep Medicine. *International Classification of Sleep Disorders, 2nd Ed.: Diagnostic and Coding Manual.* American Academy of Sleep Medicine: Westchester, IL, 2005.
44 American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*, 4th edn. Text revision. American Psychiatric Association: Washington, DC, 2000.
45 Cho MJ, Nam JJ, Suh GH. Prevalence of symptoms of depression in a nationwide sample of Korean adults. *Psychiatry Res.* 1998; **81**: 341–52.
46 Kaneita Y, Ohida T, Uchiyama M *et al.* The relationship between depression and sleep disturbances: a nationwide general population survey. *J. Clin. Psychiatry* 2006; **67**: 196–203.
47 Kawakami N, Takeshima T, Ono Y *et al.* Twelve-month prevalence, severity, and treatment of common mental disorders in communities in Japan: preliminary finding from the World Mental Health Japan Survey 2002–2003. *Psychiatry Clin. Neurosci.* 2005; **59**: 441–52.
48 Kim K, Uchiyama M, Okawa M, Liu X, Ogihara R. An epidemiological study of insomnia among the Japanese general population. *Sleep* 2000; **23**: 41–7.
49 Stewart R, Besset A, Bebbington P *et al.* Insomnia comorbidity and impact and hypnotic use by age group in a national survey population aged 16 to 74 years. *Sleep* 2006; **29**: 1391–7.
50 Lazarus RS, Folkman S. *Stress, Appraisal, and Coping.* Springer: New York, 1984.
51 Folkman S, Lazarus RS. An analysis of coping in a middle-aged community sample. *J. Health Soc. Behav.* 1980; **21**: 219–39.
52 Lexcen FJ, Hicks RA. Does cigarette smoking increase sleep problems. *Percept. Mot. Skills* 1993; **77**: 16–8.
53 Phillips BA, Danner FJ. Cigarette smoking and sleep disturbance. *Arch. Intern. Med.* 1995; **155**: 734–7.
54 Wetter DW, Young TB. The relation between cigarette smoking and sleep disturbance. *Prev. Med.* 1994; **23**: 328–34.
55 Ohida T, Kamal A, Uchiyama M *et al.* The influence of lifestyle and health status factors on sleep loss among the Japanese general population. *Sleep* 2000; **24**: 333–8.
56 Fabsitz RR, Sholinsky P, Goldberg J. Correlates of sleep problems among men: the Vietnam Era Twin Registry. *J. Sleep Res.* 1997; **6**: 50–6.
57 Soldatos CR, Allaert FA, Ohta T, Dikeos DG. How do individuals sleep around the world? Results from a single-day survey in ten contries. *Sleep Med.* 2005; **6**: 5–13.

58 Ancoli-Israel A, Roth T. Characteristics of insomnia in the Unites States: results of the 1991 National Sleep Foundation Survey. I. *Sleep* 1999; **22:** S347–53.
59 O'Connor PJ, Youngstedt SD. Influence of exercise on human sleep. *Exerc. Sport Sci. Rev.* 1995; **23:** 105–34.
60 Sung EJ, Tochihara Y. Effects of bathing and hot footbath on sleep in winter. *J. Physiol. Anthropol. Appl. Human Sci.* 2000; **19:** 21–7.
61 Monk TH, Reynolds CF 3rd, Buysse DJ, DeGrazia JM, Kupfer DJ. The relationship between lifestyle regularity and subjective sleep quality. *Chronobiol. Int.* 2003; **20:** 97–107.
62 Zisberg A, Gur-Yaish N, Shochat T. Contribution of routine to sleep quality in community elderly. *Sleep* 2010; **33:** 509–14.
63 Frank E, Hlastala S, Ritenour A *et al.* Inducing lifestyle regularity in recovering bipolar disorder patients: results from the maintenance therapies in bipolar disorder protocol. *Biol. Psychiatry* 1997; **41:** 1165–73.
64 Stepanski E, Koshorek G, Zorick F, Glinn M, Roehrs T, Roth T. Characteristics of individuals who do or do not seek treatment for chronic insomnia. *Psychosomatics* 1989; **30:** 421–7.
65 Gangwisch JE, Babiss LA, Malaspina D, Turner JB, Zammit GK, Posner K. Earlier parental set bedtimes as a protective factor against depression and suicidal ideation. *Sleep* 2010; **33:** 97–106.
66 Abe Y, Mishima K. The concepts and pathophysiology of insomnia. *Brain 21* [Japanese] 2008; **11**: 62–8.

Journal of Affective Disorders 130 (2011) 75–82

Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad

Research report

Self-help behaviors for sleep and depression: A Japanese nationwide general population survey

Ryuji Furihata [a], Makoto Uchiyama [a,*], Sakae Takahashi [a], Chisato Konno [a], Masahiro Suzuki [a], Kouichi Osaki [a], Yoshitaka Kaneita [b], Takashi Ohida [b]

[a] Department of Psychiatry, School of Medicine, Nihon University, Tokyo, Japan
[b] Division of Public Health, Department of Social Medicine, School of Medicine, Nihon University, Tokyo, Japan

ARTICLE INFO

Article history:
Received 7 May 2010
Received in revised form 11 September 2010
Accepted 18 September 2010
Available online 12 October 2010

Keywords:
Depression
Mood disorders
Sleep
Sleep hygiene
Lifestyle
Epidemiology
Coginitive
Behavioral therapy
Circadian rhythm
Alcohol

ABSTRACT

Objective: The aim of this study was to examine the relationship between self-help behaviors for sleep (SHBS) and depression among the general adult population in Japan.
Methods: The survey was conducted in June 2000 using self-administered questionnaires for subjects living in 300 communities randomly selected throughout Japan. A total of 24,686 responses were analyzed from individuals aged 20 years or older. The Center for Epidemiologic Studies Depression Scale was used to assess the prevalence of depression with two cut-off points: 16 and 25. Details of 6 types of SHBS were asked, based on given examples of actual behavior and frequency.
Results: After adjusting for sociodemographic variables, sleep problems and other SHBS, multiple logistic regression analyses revealed that "snacking on food and/or beverages" was independently associated with an increased odds ratio for depression, whereas "maintaining lifestyle regularity" was independently associated with a decreased odds ratio for depression. "Drinking alcoholic beverages," "having a bath," and "reading books or listening to music" were associated with an increased odds ratio for depression in crude analyses, but the significance of the association disappeared after adjusting for sociodemographic variables, sleep problems and other SHBS.
Limitation: Complex constructs are being correlated.
Conclusions: These results suggest that individual SHBS are differentially associated with depression, thus providing important clues for establishing sleep hygiene for treatment and prevention of depression.

1. Introduction

Sleep disturbance is common among individuals suffering from depression, and it has been reported that 50–90% of patients with depression suffer from insomnia (Tsuno et al., 2005). Conversely, previous epidemiological studies have documented that 14–20% of individuals with insomnia were diagnosed as having depression (Ford and Kamerow, 1989; Mellinger et al., 1985). Recent findings in the field of sleep and depression research have indicated that insomnia is not only a symptom of, but also a risk factor for depression (Brabbins et al., 1993; Chang et al., 1997; Foley et al., 1999; Livingston et al., 1993; Paffenbarger et al., 1994).

It has been well demonstrated that antidepressant treatments significantly improve insomnia in depressive patients, even when no interventions are employed to treat insomnia (Benca, 2000). Recently, it has been reported that co-administration of hypnotics in addition to antidepressants leads to significantly greater improvement of insomnia and depressive symptoms in patients suffering from both (Fava et al., 2006; Londborg et al., 2000). A non-controlled study has

* Corresponding author. Department of Psychiatry, Nihon University School of Medicine, Oyaguchi-kamicho, 30-1 Itabashi-ku, Tokyo 173-8610, Japan. Tel.: +81 3 3972 8111x2431; fax: +81 3 3972 2920.
E-mail address: macoto@med.nihon-u.ac.jp (M. Uchiyama).

0165-0327/$ – see front matter © 2010 Elsevier B.V. All rights reserved.
doi:10.1016/j.jad.2010.09.019

suggested that cognitive-behavioral therapy (CBT) for insomnia is effective for ameliorating not only insomnia but also symptoms of depression (Taylor et al., 2007). A more recent randomized controlled study comparing antidepressant therapy with and without CBT for insomnia documented that additional CBT for insomnia improved depressive symptoms more effectively than drug therapy alone (Manber et al., 2008). The results obtained from these studies indicate that attempted interventions to improve insomnia in patients with depression may ameliorate coexisting depressive symptoms.

Most of those who experience insomnia, before visiting physicians, seem to cope by adopting self-help behaviors for sleep (SHBS) (Morin, 2004). Previous studies have reported that such SHBS include intake of alcohol or natural products, reading books, listening to music, mental relaxation techniques, and over-the-counter sleep medications (Ancoli-Israel and Roth, 1999; Morin et al., 2006). Some SHBS may allow individuals to cope successfully with insomnia, whereas others may not. Since insomnia is reported to be one of the earliest symptoms of depression (Jackson et al., 2003; Perlis et al., 1997), it is possible to consider that patients with depression might attempt SHBS in the early stage of the disorder. Moreover, SHBS in patients with insomnia might influence the risk of developing depression, given that attempted interventions to improve insomnia have been reported to influence depression with respect to hypnotic medication therapy and CBT for insomnia, in addition to treatment of depression (Fava et al., 2006; Londborg et al., 2000; Manber et al., 2008; Taylor et al., 2007). However, there has been virtually no information about the relationships between depression and SHBS.

In the present study we investigated the associations between SHBS and depression using a cross-sectional approach, based on epidemiologic data for a large sample of the general population of Japan. Our findings provide the first documented evidence that some SHBS have a positive or negative association with depression, providing important data for establishing sleep hygiene for the treatment and prevention of depression.

2. Methods

2.1. Selection of subjects

The present study was part of a national survey (Active Survey of Health and Welfare) conducted by the Ministry of Health, Labor and Welfare of Japan in June 2000. The Active Survey of Health and Welfare was conducted in 1996, 1997, 1999 and 2000 to provide the information required for establishing governmental health and welfare policies. To ensure that the survey sample was representative of the general population, study participants were selected from residents aged 12 years or over living in 300 target areas. These areas were selected randomly, through stratified sampling, from 881,851 areas included in the national census (2000). Part-time investigators paid by the public health center in each area delivered self-administered questionnaires to the subjects and collected the completed questionnaires a few days later. Oral informed consent to participate was obtained from the subjects, whose privacy was protected in accordance with Declaration of Helsinki guidelines.

2.2. Procedures

The self-administered questionnaire consisted of 44 items, including: (1) sociodemographic information such as age, gender, and size of the community, (2) general health status, (3) physical and psychological complaints, (4) information on mental stress, (5) sleep habits and sleep problems, and (6) the Japanese version of the Center for Epidemiologic Studies Depression Scale (CES-D) (Shima et al., 1985).

The CES-D, which is a 20-item inventory designed specifically to assess symptoms of depression in the general population, was used to screen for current depressive states during the period of one week leading up to the survey (Radloff, 1977). This questionnaire is adequately reliable and valid for use in a general population. The CES-D yields an item score (range: 0–3) and a sum of the 20-item scores (range: 0–60). Higher scores indicate increasing severity of depressive symptoms. Although this scale is designed to screen, but not diagnose, major depressive disorder, a score of 16 or higher is highly suggestive of symptoms of depression. In addition, a severe cut-off point has been assumed in several studies (Cho et al., 1998; Madianos et al., 1988; Nagase et al., 2009). We set a score of 25 or higher to define CES-D-25 depression as described previously (Kaneita et al., 2006), because the cut-off point of 16 demonstrated that nearly 30% of the Japanese adult population had depression, indicating an over-estimation of prevalence in comparison with Western countries (20% or less) (Barnes et al., 1988; Eaton and Kessler, 1981; Hsu and Marshall, 1987).

The following six questions about SHBS during the previous month were embedded in the questionnaire:

1. Do you drink alcoholic beverages? (None/Once or twice per month/Once or twice per week/Three times or more per week)
2. Do you snack on food and/or beverages? (Yes/No)
3. Do you take light exercise? (Yes/No)
4. Do you take a bath? (Yes/No)
5. Do you read a book or listen to music? (Yes/No)
6. Do you try to maintain lifestyle regularity? (Yes/No)

One of the four options ("None," "Once or twice per month," "Once or twice per week," or "Three times or more per week") was to be selected regarding use of alcohol. In the statistical analysis, these four optional categories were regrouped, if required, into two categories: the former two categories and the latter two (i.e., "Once or more per week" and "Less than once per week").

With regard to sleep duration, we asked the question, "What was your average sleep duration per night?" Participants who answered "less than 6 h" were categorized as having "short sleep duration".

For subjective sleep insufficiency, participants were asked to respond to the question, "Have you had sufficiently restful sleep?" by selecting one of the following four options: "Sufficient," "Fairly sufficient," "Rather insufficient," and "Completely insufficient". Those who selected the latter two options were categorized as having "subjective insufficient sleep".

For hypnotic medications, participants were asked to respond to the question, "Did you take medicine, such as a hypnotic, during the previous month?" by selecting one of the following four options: "None/Once or twice per month/Once or twice per week/Three times or more per week." Because, in 2000, no over-the-counter hypnotic drug was available in Japan, those who selected the latter three options were categorized as using "taking hypnotic medication".

2.3. Statistical analysis

For statistical analysis, the CES-D scores were first calculated. To examine the association between sleep and CES-D scores, we calculated the CES-D scores based on responses to the remaining 19 questions after excluding one sleep question from the CES-D questionnaire. In addition, because some subjects may have omitted 5 or fewer answers on the CES-D questionnaire, we adjusted for CES-D scores using the following formula, to correct them as a conventional scale of 0 to 60: "CES-D score" = "sum of 19 item sores" × "20/19" × "19/number of answered questions." The prevalence of depression was calculated using two different cut-off points; 16 or higher (CES-D-16 depression) and 25 or higher (CES-D-25 depression). The effects of age and gender on the prevalence of depression were examined by χ^2 test. The mean value and standard deviation (S.D.) of the CES-D scores were calculated according to age and gender. The presence of SHBS was examined by age and gender. The associations of individual SHBS with CES-D-16 depression and that with CES-D-25 depression were examined. Multiple logistic regression analyses were utilized to examine the associations between depression and SHBS. In these analyses, CES-D-16 depression and CES-D-25 depression were separately taken as a response variable, and the following parameters were used as covariates: age group, size of community, short sleep duration, subjective sleep insufficiency, insomnia (difficulty initiating sleep, difficulty maintaining sleep, early morning awakening), and taking hypnotic medication. Odds ratios were calculated from both the crude analysis and the multiple logistic regression analysis with 95% confidence intervals. All analyses were performed using SPSS 16.0 for Windows.

3. Results

Questionnaires were returned by 32,729 subjects. As the Ministry of Health, Labor, and Welfare did not publish the number of residents contacted in the target areas, it was not possible to calculate the response rate for the present survey. The collection rates of similar investigations carried out 3 and 4 years earlier were 87.1% and 89.6%, respectively, and since the present survey was performed using similar methods, the response rate was estimated to be similar (Kaneita et al., 2006). Data from the following respondents were excluded from the analyses: (i) those who submitted blank answer forms (n = 707); (ii) those under 20 years of age, because the study was aimed at adults (n = 3086); (iii) those who did not respond to the questions on gender or age (n = 222); and (iv) those who neglected to answer six or more questions on the CES-D questionnaire (n = 4028). Finally, data from 24,686 adults were analyzed.

Although the percentages of both men and women aged 70 years or older were slightly less than those revealed by the census, the percentages of other age groups were similar (Table 1).

The prevalence of CES-D-16 depression and that of CES-D-25 depression, together with the mean value and S.D. of the CES-D scores sorted by gender and age groups, are shown in Table 2. Both CES-D-16 depression and CES-D-25 depression were more prevalent in women than in men ($\chi^2 = 52.61$, $df = 1$, $p < 0.01$ for CES-D-16 depression and $\chi^2 = 28.59$, $df = 1$, $p < 0.01$ for CES-D-25 depression). By age groups, both CES-D-16 depression and CES-D-25 depression were most frequent in those aged 70 years or older ($\chi^2 = 118.7$, $df = 5$, $p < 0.01$ for CES-D-16 depression and $\chi^2 = 171.2$, $df = 5$, $p < 0.01$ for CES-D-25 depression).

The prevalence of SHBS by gender and age group is shown in Table 3. The overall prevalence of SHBS differed significantly between men and women ($p < 0.01$). Male dominance was apparent for "drinking alcoholic beverages" (48.3% vs. 18.3%) and "snacking on food and/or beverages" (36.1% vs. 27.9%), whereas female dominance was apparent for "exercising" (29.4% vs. 26.2%), "having a bath" (64.4% vs. 59.0%), "reading books or listening to music" (49.4% vs. 43.4%) and "maintaining lifestyle regularity" (58.6% vs. 49.0%).

All types of SHBS differed significantly among age groups ($p < 0.01$). "Reading books or listening to music" was prevalent in the younger group (20–39 years), "drinking alcoholic beverages" and "snacking on food and/or beverages" were prevalent in the middle-aged group (40–59 years), and other types of SHBS were prevalent in the old-age group (60 years and over) for both men and women.

Table 4 shows the association between individual SHBS and depression. "Drinking alcoholic beverages," "snacking on food and/or beverages," "having a bath" and "reading books or listening to music" were associated with an increased odds ratio for CES-D-16 depression after adjustment for sociodemographic variables, sleep problems and other SHBS. "Maintaining lifestyle regularity" was associated with a decreased odds ratio for CES-D-16 depression after adjustment for sociodemographic variables, sleep problems and other SHBS. "Exercising" was associated with an increased odds ratio for CES-D-16 depression in the crude analysis, but not in the multivariate model after adjustment for sociodemographic variables, sleep problems and other SHBS.

Table 1
Percentages of study participants and the general population classified according to gender and age groups.

Age (year)	Present study (2000)		Census (2000)	
	Male	Female	Male	Female
20–29	18%	18%	19%	17%
30–39	18%	18%	18%	16%
40–49	19%	18%	17%	16%
50–59	21%	20%	20%	19%
60–69	15%	14%	15%	15%
70+	9%	12%	12%	17%
Total	100%	100%	100%	100%
n	11,752	12,934	48,669 (thousands)	52,067 (thousands)

Due to rounding, the percentages may not equal 100%.

Table 2
Prevalence of Depression and Mean Center for Epidemiologic Studies Depression Scale (CES-D) score by gender and age group.

	CES-D-16 Depression			CES-D-25 Depression			Mean + S.D.
Age group (year)	Total (%)	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	CES-D Score
20–29	30.0	28.6	31.3	10.1	8.9	11.2	13.4 ± 8.4
30–39	26.3	23.2	29.2	7.7	6.2	9.1	12.5 ± 8.0
40–49	27.9	26.7	29.1	8.9	8.2	9.5	13.1 ± 8.1
50–59	26.6	24.4	28.7	7.6	6.6	8.7	12.9 ± 7.5
60–69	24.8	23.5	26.0	7.5	8.1	7.0	12.8 ± 7.7
70–	36.0	32.3	38.6	15.7	14.1	16.7	15.0 ± 9.2
Total	28.1	25.9	30.1	9.1	8.1	10.1	13.2 ± 8.1

CES-D-16 Depression was defined from the CES-D score using a cut-off point of 16 or higher.
CES-D-25 Depression was defined from the CES-D score using a cut-off point of 25 or higher.

"Snacking on food and/or beverages" was associated with an increased odds ratio for CES-D-25 depression after adjustment for sociodemographic variables, sleep problems and other SHBS (OR = 1.37, 95% CI = 1.20–1.58). "Maintaining lifestyle regularity" was associated with a decreased odds ratio for CES-D-25 depression after adjustment for sociodemographic variables, sleep problems and other SHBS (OR = 0.70, 95% CI = 0.61–0.80). "Drinking alcoholic beverages," "having a bath," and "reading books or listening to music" were associated with an increased odds ratio for CES-D-25 depression in the crude analysis, but only "drinking alcoholic beverages" remained significant after adjusting for sociodemographic variables and sleep problems. However, these associations disappeared in the multivariate model after adjustment for sociodemographic variables, sleep problems and other SHBS.

4. Discussion

This report represents one of the first attempts to investigate the association between SHBS and depression among the general adult population in Japan.

"Maintaining lifestyle regularity" was independently associated with a decreased odds ratio for CES-D-25 depression after adjustment for sociodemographic variables, sleep problems and other SHBS. Possible preventive effects of a regular lifestyle and possible risks of an irregular lifestyle on mental health have been documented in previous studies in clinical or community settings (Hayakawa et al., 2005; Regestein and Monk, 1995; Scott et al., 1997; Shen et al., 2008). Those studies indicated that shift work was a risk factor for mood disorders via the influences of an irregular lifestyle and psychological stress due to a shift work schedule. In their epidemiological survey, Scott et al. identified a high prevalence of major depressive disorder during or after shift work, and found that the longer an individual was engaged in shift work, there was a higher lifetime risk of depression. Shen and co-workers investigated 414 college students and found that lifestyle irregularity prospectively predicted the survival time to affective episodes during a 33-month study period. Depression was reported to be a prevalent comorbid condition with chronic lifestyle deterioration due to intrinsic circadian rhythm sleep disorders. Regestein et al. studied 33 sleep disorder clinic outpatients with delayed sleep phase syndrome and found that 25 (76%) of them were, or had been, depressed. Hayakawa et al. investigated 55 patients diagnosed as having non-24-hour sleep-wake syndrome and found that 34% of them without a history of mood disorders developed major depressive disorder after the onset of non-24-hour sleep-wake syndrome. These previous studies clearly demonstrated that an irregular lifestyle may have caused depression, and indicated that the likely pathophysiological mechanism was related to disruption of circadian rhythms, as has been proposed for classical circadian rhythm theories of mood disorders (Kripke, 1983; Wehr and Goodwin, 1981; Wehr et al., 1979).

In line with the above assumption, maintenance of lifestyle regularity may be considered to have a beneficial effect for patients with mood disorders (Ehlers et al., 1988; Frank et al., 1997; Frank et al., 1999; Leibenluft and Suppes, 1999). However, there has been no clear epidemiological evidence to confirm the favorable effect of such interventions. In the present cross-sectional study, we found, for the first time, a decreased odds ratio between depression and

Table 3
Prevalence of self-help behaviors for sleep by gender and age group.

	Male					Female					
	Total (%)	20–39 y (%)	40–59 y (%)	>60 y (%)	Sig. 1	Total (%)	20–39 y (%)	40–59 y (%)	>60 y (%)	Sig. 1	Sig. 2
Drinking alcoholic beverages	48.3	37.0	59.6	47.9	$\chi2 = 373.44$ *	18.3	16.8	23.5	11.5	$\chi2 = 123.98$ *	$\chi2 = 1848.08$ *
Snacks and/or beverages	36.1	36.1	40.0	27.4	$\chi2 = 62.82$ *	27.9	29.0	30.4	20.7	$\chi2 = 56.41$ *	$\chi2 = 127.85$ *
Exercising	26.2	23.6	27.3	30.3	$\chi2 = 25.04$ *	29.4	26.1	32.7	30.6	$\chi2 = 38.90$ *	$\chi2 = 21.77$ *
Taking a bath	59.0	50.4	64.2	68.1	$\chi2 = 191.03$ *	64.4	56.3	72.1	66.7	$\chi2 = 204.99$ *	$\chi2 = 52.75$ *
Reading a book or listening to music	43.4	48.8	38.9	39.5	$\chi2 = 74.70$ *	49.4	51.9	50.0	42.7	$\chi2 = 41.66$ *	$\chi2 = 60.65$ *
Maintaining lifestyle regularity	49.0	36.9	54.2	65.7	$\chi2 = 394.93$ *	58.6	49.8	63.6	67.8	$\chi2 = 224.92$ *	$\chi2 = 160.15$ *

Sig, significance.
Sig 1: $\chi2$ test, 2 (each SHBS-Yes or No; Drinking alcoholic beverages, Snacks and/or beverages, Exercising, Taking a bath, Reading a book or listening to music, Maintaining lifestyle regularity) × 3 (age groups; 20–39. 40–59, 61+).
Sig 2: $\chi2$ test, 2 (each SHBS-Yes or No; Drinking alcoholic beverages, Snacks and/or beverages, Exercising, Taking a bath, Reading a book or listening to music, Maintaining lifestyle regularity) × 2 (gender effect; male, female).
* $p<.01$.

Table 4
Association between self-help behaviors for sleep and depression.

	CES-D-16 depression						CES-D-25 depression					
	Crude		Adjusted [a]		Adjusted [b]		Crude		Adjusted [a]		Adjusted [b]	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Drinking alcoholic beverages												
No	1.00		1.00		1.00		1.00		1.00		1.00	
Yes	1.22	1.14–1.31 **	1.25	1.14–1.36 **	1.10	1.00–1.21 *	1.13	1.02–1.26 *	1.16	1.01–1.33 **	1.05	0.90–1.22
Snacks and/or beverages												
No	1.00		1.00		1.00		1.00		1.00		1.00	
Yes	1.67	1.55–1.79 **	1.56	1.44–1.69 **	1.44	1.31–1.57 **	1.54	1.38–1.72 **	1.41	1.24–1.59 **	1.37	1.20–1.58 **
Exercising												
No	1.00		1.00		1.00		1.00		1.00		1.00	
Yes	1.10	1.02–1.19 *	1.07	0.98–1.16	0.94	0.86–1.04	1.10	0.98–1.24	1.05	0.92–1.21	1.03	0.88–1.19
Taking a bath												
No	1.00		1.00		1.00		1.00		1.00		1.00	
Yes	1.33	1.24–1.43 **	1.34	1.24–1.45 **	1.28	1.17–1.40 **	1.16	1.04–1.30 *	1.12	0.99–1.27	1.08	0.94–1.24
Reading a book or listening to music												
No	1.00		1.00		1.00		1.00		1.00		1.00	
Yes	1.33	1.24–1.42 **	1.22	1.13–1.32 **	1.15	1.05–1.25 **	1.24	1.12–1.39 **	1.11	0.98–1.25	1.10	0.96–1.26
Maintaining lifestyle regularity												
No	1.00		1.00		1.00		1.00		1.00		1.00	
Yes	0.79	0.74–0.84 **	0.82	0.76–0.88 **	0.70	0.64–0.76 **	0.74	0.66–0.82 **	0.77	0.68–0.87 **	0.70	0.61–0.80 **

OR, adjusted odds ratio; CI, confidence interval.
[a] Adjusted for age group, sex, size of community, short sleep duration, subjective sleep insufficiency, insomnia (difficulty initiating sleep, difficulty maintaining sleep, early morning awakening), and taking hypnotic medication.
[b] Adjusted for age group, sex, size of community, short sleep duration, subjective sleep insufficiency, insomnia (difficulty initiating sleep, difficulty maintaining sleep, early morning awakening), taking hypnotic medication, and other SHBS.
* $p<.05$.
** $p<.01$.

relationship was not determined because of the limitation of the cross-sectional approach. From a clinical viewpoint, there may be several different interpretations regarding the association between lifestyle regularity and depression. One interpretation can be drawn from the hypothesized etiological roles of circadian rhythm disturbances on mood disorders (Kripke, 1983; Wehr and Goodwin, 1981; Wehr et al., 1979); subjects who had maintained lifestyle regularity were freer from depression risk than those who had not. In this survey, a considerable number of the sampled subjects had attempted to maintain lifestyle regularity to achieve sufficient sleep, but this might have been beneficial to their mental health independently of sleep states. Another possible interpretation can be derived in terms of depressive symptomatology; only subjects who did not suffer from depression were able to maintain lifestyle regularity because the hypoactive tendency attributable to psychomotor retardation, or the hyperactive tendency attributable to psychomotor agitation, together with severe insomnia in depressive patients, would have been likely to disturb lifestyle regularity (Monk et al., 1991; Szuba et al., 1992).

A prospective study is warranted to examine the causal relationship between maintenance of lifestyle regularity for obtaining enough sleep, and depression. Given the fact that maintaining a regular lifestyle to obtain sufficient sleep decreases the risk for depression, this SHBS may be included in clinical assessments for interventions aimed at prevention and treatment of depression.

"Snacking on food and/or beverages" to obtain enough sleep, which was found in 31.8% (male 36.1%, female 27.9%) of the adult general population in the present study, was depression. It has been well documented that hunger at bedtime disturbs the ability to fall asleep, finally leading to snacking before going to bed (Vanitallie, 2006). By contrast, eating an excessive amount of food before the bedtime is assumed to activate neural activities associated with digestion for several hours, and to disturb sleep quality thereafter. Likewise, most non-pharmacological interventions for insomnia, such as stimulus control therapy or sleep hygiene education, have indicated the potentially unfavorable effect of snacking on sleep (Morin, 2000). Since disturbed sleep naturally leads to an uncomfortable feeling or bad mood the following morning (American Psychiatric Association, 2000; American Academy of Sleep Medicine, 2005), it is possible to assume that snacking before bedtime may disturb mood by aggravating sleep quality. However, in the present study, the positive association between bedtime snacking and depression remained significant after adjustment for sociodemographic variables, sleep problems and other SHBS, indicating that this association was unlikely to be mediated by parameters of insomnia or sleep insufficiency. One possible interpretation can be made with respect to sleep apnea syndrome, which we did not use as a confounding factor in the present multivariate model. Many reports have indicated that chronic poor sleep quality due to obstructive sleep apnea, which is aggravated and sometimes caused by night-time eating and obesity, is frequently associated with depressive mood (Froese et al., 2008; Nabi et al., 2006; Ohayon, 2003; Peppard et al., 2006). It may also be possible to postulate that obesity associated with night-time eating may pose a risk for depression, since some epidemiological studies have

indicated that obesity is a risk factor for depression (Roberts et al., 2003; Johnston et al., 2004; Ohayon and Hong, 2006; Onyike et al., 2003; Ross, 1994; Simon et al., 2006). A chronobiological interpretation may be derived based on the effect of feeding schedule on circadian rhythms (Grandin et al., 2006; Monk et al., 1991). Snacking before going to bed could disturb the timing of the circadian pacemaker. Disturbance of circadian rhythms and/or their dissociation of sleep timing have been postulated to be of etiological importance in the genesis of depression (Kripke, 1983; Wehr and Goodwin, 1981; Wehr et al., 1979). It is possible to interpret that "snacking on food and/or beverages" was a consequence of depressive symptomatology. Some patients with depression show an abnormally increased appetite and weight gain, although at a frequency lower than that of appetite loss. Previous studies have documented that 28–42% of depressed outpatients show increased appetite and weight during depressive episodes (Nierenberg et al., 1998; Robertson et al., 1996; Sidney et al., 1993). Therefore, in such depressed patients, the tendency to eat at bedtime might be influenced by an abnormally increased appetite. However, this possibility is unlikely because those who provided an affirmative response to this question primarily considered "snacking on food and/or beverages" to be a method for obtaining enough sleep.

Although further longitudinal studies are needed to replicate this finding, and to explore the causal link, snacking on food and/or beverages to obtain enough sleep may be considered a risk factor for depression. Because a considerable number of people sampled in this study attempted this SHBS, it will be important in future public health activities to inform the Japanese populace that snacking on food and/or beverages in order to obtain enough sleep may pose a risk for depression.

"Drinking alcoholic beverages," "having a bath," and "reading books or listening to music" were associated with an increased odds ratio for CES-D-25 depression in crude analyses, but only "drinking alcoholic beverages" remained significant after adjustment for sociodemographic variables and sleep problems. However, the significance of all these associations disappeared after adjustment for sociodemographic variables, sleep problems and other SHBS.

In the present study, "having a bath" and "reading books or listening to music" were associated with an increased odds ratio for depression in crude analysis. However, the significance of the association disappeared after adjustment for sociodemographic variables and sleep problems, suggesting that the associations between these SHBS and depression are mediated by sleep problems. Previous cross-sectional studies have found that the prevalence of "reading and listening to music" in insomniacs is higher than in non-insomniacs (Ancoli-Israel and Roth, 1999; Morin et al., 2006). Studies on the effects of bathing on sleep reported that bathing at an appropriate temperature (approximately 40 °C) before going to bed tended to deepen nocturnal sleep (Dorsey et al., 1996; Horne and Reid, 1985; Horne and Staff, 1983) in healthy subjects and to improve sleep efficiency in insomniacs (Dorsey et al., 1996). However, no studies have examined the relationship between these SHBS and depression. The association between drinking alcoholic beverages and depression remained significant after adjustment for sociodemographic variables and sleep problems, indicating that the association of drinking alcoholic beverages at bedtime with depression was partly a direct one. A prospective study is warranted to examine the complex interactions among SHBS, sleep problems and depression.

There were some limitations to this study. First, it was a cross-sectional one, and therefore causal relationships between SHBS and symptoms of depression could not be determined. Second, depression defined in this study may have included other psychiatric disorders such as anxiety disorders. Third, respondents who neglected to answer six or more questions out of 20 in the CES-D questionnaire were excluded from the analysis, and thus a non-response bias regarding CES-D may have been generated. Fourth, a self-reported approach was adopted, and the percentage of respondents aged 70 years or older was less than that of persons aged 70 years or older in the general population as revealed by the census. It was assumed that physical difficulties of old age, such as poor eyesight, difficulty in writing, long-term physical pain and low self-recognition for health, might have made it difficult for elderly subjects to respond to the questionnaire. Further improvements, such as the introduction of an interview method, would be helpful in the future. Fifth, questions on sociodemographic factors, such as working status, size of family, education, and income, were not included in the questionnaire. These factors could possibly influence both depression and SHBS. In future studies, items on the above-mentioned points, which were not included in the present study, must be included in the questionnaires in order to improve the validity of studies on SHBS and depression. Sixth, no previous study had demonstrated the reliability of the questions for assessing self-help behavior for sleep.

This report represents one of the first to investigate the association between SHBS and depression among the general adult population. It was concluded that individual SHBS were differentially associated with depression. These results may provide important clues for establishing sleep hygiene for treatment and prevention of depression, and appear to warrant further study of this issue.

Role of funding source

This study was partly supported by Health Science Research Grants from the Ministry of Health, Labor and Welfare of the Japanese Government (H18-JUNKANKITOU-005 and H20-JUNKANKITOU-IPPAN-002), and by a Research Grant from the Japan Society for Promoting Scienceand Technology Agency (18603012, 2006–2007). The authors report no other financial affiliation or relationship relevant to the subject of the article.

Conflict of interest

This was not an industry supported study. Dr. Uchiyama has received research support from Astellas, Meiji Seika, Nippon Boehringer Ingelheim, Pfizer Japan, Sanofi-Aventis, Schering Plough, and Takeda Pharmaceuticals; has consulted for Pfizer Japan, Sanofi-Aventis and Takeda Pharmaceuticals. All other authors declare that they have no conflicts of interest.

Acknowledgement

This study was partly supported by Health Science Research Grants from the Ministry of Health, Labor and Welfare of the Japanese Government (H18-JUNKANKITOU-005 and H20-JUNKANKITOU-IPPAN-002), and by a Research Grant from the Japan Society for Promoting Science and Technology Agency

(18603012, 2006–2007). The authors report no other financial affiliation or relationship relevant to the subject of the article.

Appendix A. Supplementary data

Supplementary data to this article can be found online at doi:10.1016/j.jad.2010.09.019.

References

American Academy of Sleep Medicine, 2005. International Classification of Sleep Disorders: Diagnostic & Coding Manual. American Academy of Sleep Medicine, Westchster, IL.

American Psychiatric Association, 2000. Diagnostic and Statistical Manual of Mental Disorders: DSM-IV-TR. American Psychiatric Association, Washington, DC.

Ancoli-Israel, S., Roth, T., 1999. Characteristics of insomnia in the United States: results of the 1991 National Sleep Foundation Survey. I. Sleep 22 (Suppl 2), S347–S353.

Barnes, G.E., Currie, R.F., Segall, A., 1988. Symptoms of depression in a Canadian urban sample. Can. J. Psychiatry 33, 386–393.

Benca, R.M., 2000. Mood Disorders, In: Kryger, M.H., Roth, T. (Eds.), Principles and Practice of Sleep Medicine, 3 rd ed. WB Saunders Company, Phialadelphia, Pa, pp. 1140–1157.

Brabbins, C.J., Dewey, M.E., Copeland, J.R.M., Davidson, L.A., McWilliam, C., Saunders, P., Sharma, V.K., Sullivan, C., 1993. Insomnia in the elderly: prevalence, gender differences and relationships with morbidity and mortality. Int. J. Geriatr. Psychiatry 8, 473–480.

Chang, P.P., Ford, D.E., Mead, L.A., Cooper-Patrick, L., Klag, M.J., 1997. Insomnia in young men and subsequent depression. The Johns Hopkins Precursors Study. Am. J. Epidemiol. 146, 105–114.

Cho, M.J., Nam, J.J., Suh, G.H., 1998. Prevalence of symptoms of depression in a nationwide sample of Korean adults. Psychiatry Res. 81, 341–352.

Dorsey, C.M., Lukas, S.E., Teicher, M.H., Harper, D., Winkelman, J.W., Cunningham, S.L., Satlin, A., 1996. Effects of passive body heating on the sleep of older female insomniacs. J. Geriatr. Psychiatry Neurol. 9, 83–90.

Eaton, W.W., Kessler, L.G., 1981. Rates of symptoms of depression in a national sample. Am. J. Epidemiol. 114, 528–538.

Ehlers, C.L., Frank, E., Kupfer, D.J., 1988. Social zeitgebers and biological rhythms. A unified approach to understanding the etiology of depression. Arch. Gen. Psychiatry 45, 948–952.

Fava, M., McCall, W.V., Krystal, A., Wessel, T., Rubens, R., Caron, J., Amato, D., Roth, T., 2006. Eszopiclone co-administered with fluoxetine in patients with insomnia coexisting with major depressive disorder. Biol. Psychiatry 59, 1052–1060.

Foley, D.J., Monjan, A., Simonsick, E.M., Wallace, R.B., Blazer, D.G., 1999. Incidence and remission of insomnia among elderly adults: an epidemiologic study of 6,800 persons over three years. Sleep 22 (Suppl 2), S366–S372.

Ford, D.E., Kamerow, D.B., 1989. Epidemiologic study of sleep disturbances and psychiatric disorders. An opportunity for prevention? JAMA 262, 1479–1484.

Frank, E., Hlastala, S., Ritenour, A., Houck, P., Tu, X.M., Monk, T.H., Mallinger, A.G., Kupfer, D.J., 1997. Inducing lifestyle regularity in recovering bipolar disorder patients: results from the maintenance therapies in bipolar disorder protocol. Biol. Psychiatry 41, 1165–1173.

Frank, E., Swartz, H.A., Mallinger, A.G., Thase, M.E., Weaver, E.V., Kupfer, D.J., 1999. Adjunctive psychotherapy for bipolar disorder: effects of changing treatment modality. J. Abnorm. Psychol. 108, 579–587.

Froese, C.L., Butt, A., Mulgrew, A., Cheema, R., Speirs, M.A., Gosnell, C., Fleming, J., Fleetham, J., Ryan, C.F., Ayas, N.T., 2008. Depression and sleep-related symptoms in an adult, indigenous, North American population. J. Clin. Sleep Med. 4, 356–361.

Grandin, L.D., Alloy, L.B., Abramson, L.Y., 2006. The social zeitgeber theory, circadian rhythms, and mood disorders: review and evaluation. Clin. Psychol. Rev. 26, 679–694.

Hayakawa, T., Uchiyama, M., Kamei, Y., Shibui, K., Tagaya, H., Asada, T., Okawa, M., Urata, J., Takahashi, K., 2005. Clinical analyses of sighted patients with non-24-hour sleep-wake syndrome: a study of 57 consecutively diagnosed cases. Sleep 28, 945–952.

Horne, J.A., Reid, A.J., 1985. Night-time sleep EEG changes following body heating in a warm bath. Electroencephalogr. Clin. Neurophysiol. 60, 154–157.

Horne, J.A., Staff, L.H., 1983. Exercise and sleep: body-heating effects. Sleep 6, 36–46.

Hsu, K., Marshall, V., 1987. Prevalence of depression and distress in a large sample of Canadian residents, interns, and fellows. Am. J. Psychiatry 144, 1561–1566.

Jackson, A., Cavanagh, J., Scott, J., 2003. A systematic review of manic and depressive prodromes. J. Affect. Disord. 74, 209–217.

Johnston, E., Johnson, S., McLeod, P., Johnston, M., 2004. The relation of body mass index to depressive symptoms. Can. J. Public Health 95, 179–183.

Kaneita, Y., Ohida, T., Uchiyama, M., Takemura, S., Kawahara, K., Yokoyama, E., Miyake, T., Harano, S., Suzuki, K., Fujita, T., 2006. The relationship between depression and sleep disturbances: a Japanese nationwide general population survey. J. Clin. Psychiatry 67, 196–203.

Kripke, D.F., 1983. Phase-Advance Theories for Affective Illness. In: Wehr, T.A., Goodwin, F.K. (Eds.), Circadian Rhythms in Psychiatry. Boxwood Press, Pacific Grove, CA, pp. 41–69.

Leibenluft, E., Suppes, T., 1999. Treating bipolar illness: focus on treatment algorithms and management of the sleep-wake cycle. Am. J. Psychiatry 156, 1976–1981.

Livingston, G., Blizard, B., Mann, A., 1993. Does sleep disturbance predict depression in elderly people? A study in inner London. Br. J. Gen. Pract. 43, 445–448.

Londborg, P.D., Smith, W.T., Glaudin, V., Painter, J.R., 2000. Short-term cotherapy with clonazepam and fluoxetine: anxiety, sleep disturbance and core symptoms of depression. J. Affect. Disord. 61, 73–79.

Madianos, M.G., Tomaras, V., Kapsali, A., Vaidakis, N., Vlachonicolis, J., Stefanis, C.N., 1988. Psychiatric case identification in two Athenian communities: estimation of the probable prevalence. Acta Psychiatr. Scand. 78, 24–31.

Manber, R., Edinger, J.D., Gress, J.L., San Pedro-Salcedo, M.G., Kuo, T.F., Kalista, T., 2008. Cognitive behavioral therapy for insomnia enhances depression outcome in patients with comorbid major depressive disorder and insomnia. Sleep 31, 489–495.

Mellinger, G.D., Balter, M.B., Uhlenhuth, E.H., 1985. Insomnia and its treatment. Prevalence and correlates. Arch. Gen. Psychiatry 42, 225–232.

Monk, T.H., Kupfer, D.J., Frank, E., Ritenour, A.M., 1991. The Social Rhythm Metric (SRM): measuring daily social rhythms over 12 weeks. Psychiatry Res. 36, 195–207.

Morin, C.M., 2000. Psychological and Behavioral Treatments for Primary Insomnia, In: Kryger, M.H., Roth, T. (Eds.), Principles and Practice of Sleep Medicine, 3 rd ed. WB Saunders Company, Phialadelphia, Pa, pp. 726–737.

Morin, C.M., 2004. Cognitive-behavioral approaches to the treatment of insomnia. J. Clin. Psychiatry 65 (Suppl 16), 33–40.

Morin, C.M., LeBlanc, M., Daley, M., Gregoire, J.P., Merette, C., 2006. Epidemiology of insomnia: prevalence, self-help treatments, consultations, and determinants of help-seeking behaviors. Sleep Med. 7, 123–130.

Nabi, H., Gueguen, A., Chiron, M., Lafont, S., Zins, M., Lagarde, E., 2006. Awareness of driving while sleepy and road traffic accidents: prospective study in GAZEL cohort. BMJ 333, 75.

Nagase, Y., Uchiyama, M., Kaneita, Y., Li, L., Kaji, T., Takahashi, S., Konno, M., Mishima, K., Nishikawa, T., Ohida, T., 2009. Coping strategies and their correlates with depression in the Japanese general population. Psychiatry Res. 168, 57–66.

Nierenberg, A.A., Alpert, J.E., Pava, J., Rosenbaum, J.F., Fava, M., 1998. Course and treatment of atypical depression. J. Clin. Psychiatry 59 (Suppl 18), 5–9.

Ohayon, M.M., 2003. The effects of breathing-related sleep disorders on mood disturbances in the general population. J. Clin. Psychiatry 64, 1195–1200 quiz, 1274-1196.

Ohayon, M.M., Hong, S.C., 2006. Prevalence of major depressive disorder in the general population of South Korea. J. Psychiatr. Res. 40, 30–36.

Onyike, C.U., Crum, R.M., Lee, H.B., Lyketsos, C.G., Eaton, W.W., 2003. Is obesity associated with major depression? Results from the Third National Health and Nutrition Examination Survey. Am. J. Epidemiol. 158, 1139–1147.

Paffenbarger Jr., R.S., Lee, I.M., Leung, R., 1994. Physical activity and personal characteristics associated with depression and suicide in American college men. Acta Psychiatr. Scand. Suppl. 377, 16–22.

Peppard, P.E., Szklo-Coxe, M., Hla, K.M., Young, T., 2006. Longitudinal association of sleep-related breathing disorder and depression. Arch. Intern. Med. 166, 1709–1715.

Perlis, M.L., Giles, D.E., Buysse, D.J., Tu, X., Kupfer, D.J., 1997. Self-reported sleep disturbance as a prodromal symptom in recurrent depression. J. Affect. Disord. 42, 209–212.

Radloff, L.S., 1977. The CES-D scale: a self-report depression scale for research in the general population. Appl. Psychol. Meas. 1, 385–401.

Regestein, Q.R., Monk, T.H., 1995. Delayed sleep phase syndrome: a review of its clinical aspects. Am. J. Psychiatry 152, 602–608.

Roberts, R.E., Deleger, S., Strawbridge, W.J., Kaplan, G.A., 2003. Prospective association between obesity and depression: evidence from the Alameda County Study. Int. J. Obes. Relat. Metab. Disord. 27, 514–521.

Robertson, H.A., Lam, R.W., Stewart, J.N., Yatham, L.N., Tam, E.M., Zis, A.P., 1996. Atypical depressive symptoms and clusters in unipolar and bipolar depression. Acta Psychiatr. Scand. 94, 421–427.
Ross, C.E., 1994. Overweight and depression. J. Health Soc. Behav. 35, 63–79.
Scott, A.J., Monk, T.H., Brink, L.L., 1997. Shiftwork as a risk factor for depression: a pilot study. Int. J. Occup. Environ. Health 3, S2–S9.
Shen, G.H., Alloy, L.B., Abramson, L.Y., Sylvia, L.G., 2008. Social rhythm regularity and the onset of affective episodes in bipolar spectrum individuals. Bipolar Disord. 10, 520–529.
Shima, S., Shikano, T., Kitamura, T., Asai, M., 1985. A new selfrating scale for depression. Clin. Psychiatry 27, 717–723.
Sidney, Z., Stephen, R.S., Thomas, G., Paul, S., 1993. Atypical depression in an outpatient psychiatric population. Depression 1, 268–274.
Simon, G.E., Von Korff, M., Saunders, K., Miglioretti, D.L., Crane, P.K., van Belle, G., Kessler, R.C., 2006. Association between obesity and psychiatric disorders in the US adult population. Arch. Gen. Psychiatry 63, 824–830.
Szuba, M.P., Yager, A., Guze, B.H., Allen, E.M., Baxter Jr., L.R., 1992. Disruption of social circadian rhythms in major depression: a preliminary report. Psychiatry Res. 42, 221–230.
Taylor, D.J., Lichstein, K.L., Weinstock, J., Sanford, S., Temple, J.R., 2007. A pilot study of cognitive-behavioral therapy of insomnia in people with mild depression. Behav. Ther. 38, 49–57.
Tsuno, N., Besset, A., Ritchie, K., 2005. Sleep and depression. J. Clin. Psychiatry 66, 1254–1269.
Vanitallie, T.B., 2006. Sleep and energy balance: interactive homeostatic systems. Metabolism 55, S30–S35.
Wehr, T.A., Goodwin, F.K., 1981. Biological Rhythms and Psychiatry. In: Arieti, S., Brodie, H.K.H. (Eds.), American Handbook of Psychiatry. Basic Books, New York, pp. 46–74.
Wehr, T.A., Wirz-Justice, A., Goodwin, F.K., Duncan, W., Gillin, J.C., 1979. Phase advance of the circadian sleep-wake cycle as an antidepressant. Science 206, 710–713.

日本における向精神薬の処方実態
——ベンゾジアゼピン系薬物を中心に

Actual status of prescription patterns of psychotropic medication in Japan

三島和夫
Kazuo Mishima
国立精神・神経医療研究センター精神保健研究所・精神生理研究部

◎欧米諸国と同様に，日本国内でも向精神薬(睡眠薬，抗うつ薬，抗不安薬および抗精神病薬)の処方頻度は増加傾向にある．各向精神薬の処方率や処方力価には，性別や年齢によって差異がみられる．睡眠薬や抗不安薬の主剤であるベンゾジアゼピン系薬物の処方率は男女ともに加齢に伴って増加するのに対して，抗うつ薬の処方率は男性では働き盛りの40代前後，女性では65歳以上にピークを示す．また，睡眠薬および抗不安薬は半数以上が一般身体科で処方され，高齢者や身体合併症を有する患者など，有害事象の生じやすいハイリスク群に対しても高頻度に処方されている．向精神薬のリスク・ベネフィットや薬物相互作用に関する臨床薬理情報は不足しており，安全性に優れた治療ストラテジーや長期処方を回避するための減薬方法を含め，適正使用に関するガイドラインを整備する必要がある．

Key word：向精神薬，処方率，処方力価，睡眠薬，抗うつ薬，抗不安薬，抗精神病薬

精神医療のみならず一般身体科の実地診療でも，向精神薬(睡眠薬，抗うつ薬，抗不安薬，抗精神病薬など)は繁用される．既報では一般人口における向精神薬の服用率は1.5〜10%とされ，年齢階層で変動はあるものの一般的に女性で高く，また加齢に伴って増大する．欧米諸国と同様に，日本でも向精神薬の処方は増加傾向にある．その背景には心理・社会的ストレスの増大，高齢者の増加，メンタルヘルスに対する社会的関心の高まりやそれに対応する精神科医療の普及などの多数の要因が考えられる．近年の精神医療の受療患者数の増加を考え合わせると，向精神薬のニーズが高まっていることは間違いない．一方で，向精神薬が広く使用されるにつれて耐性，依存，乱用などの事例も増加し社会問題となっている．また，エビデンスが乏しいままに，適応疾患以外にも向精神薬がoff labelで汎用されている現状も危惧される．欧米諸国では多剤併用や薬物の適切でない服用の弊害に関心が高まっており，診療報酬データを用いた向精神薬の処方実態に関する報告(薬剤疫学研究)が増加している．著者らは，厚生労働科学研究事業として約33万人の加入者を有する複数の健保団体の診療報酬データをソースとして，2005年から現在まで日本国内での向精神薬の処方量，使用期間，併用薬物に関する経年的調査を継続している[1]．

本稿では主として2005年の解析値をもとに，ベンゾジアゼピン系薬物をはじめとする向精神薬の日本国内での処方の現状と問題点について解説する．

薬剤疫学調査

向精神薬の処方実態とその背景要因の調査には，患者を対象とした処方薬剤名，処方頻度，処方量，処方月のみならず，基礎疾患の重症度，薬物療法以外の治療，実施した検査などに関する付加情報が必要である．しかし，これらの情報を一括して収集することは容易ではない．連続例研究などでは調査対象患者数が限られるほか，サンプルバイアスが強く，またそもそも調査集団や服用

表 1　各向精神薬の一般人口における推定処方率

		1カ月処方率			3カ月処方率
		4月	5月	6月	4〜6月
睡眠薬	一般男性	2.16	2.07	2.06	3.02
	一般女性	3.02	2.99	2.99	4.29
	一般人口	2.59	2.56	2.55	3.66
抗うつ薬	一般男性	1.36	1.37	1.40	1.74
	一般女性	1.70	1.72	1.70	2.27
	一般人口	1.54	1.56	1.56	2.02
抗不安薬	一般男性	2.37	2.29	2.30	3.37
	一般女性	3.81	3.91	3.87	5.53
	一般人口	3.08	3.09	3.08	4.42
抗精神病薬	一般男性	0.41	0.43	0.43	0.55
	一般女性	0.70	0.67	0.72	0.87
	一般人口	0.53	0.52	0.55	0.67

一般人口における推定処方率は，2005 年国勢調査・年齢別人口データを用いて算出した．

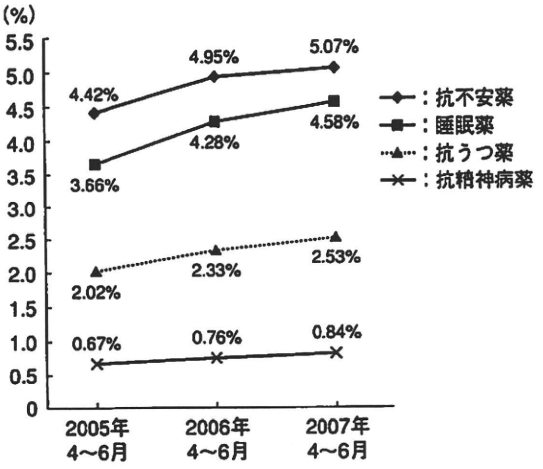

図 1　日本の一般人口における向精神薬の3カ月推定処方率の年次推移

2005〜2007 各年の 4〜6 月における各向精神薬の処方率を示した．いずれの向精神薬も処方率が増加している(国勢調査の性・年齢別人口データで調整ずみ；文献[1]から作成)．

者の母数が不明であるため，処方頻度や副作用の発現頻度を明らかにすることができない．大規模診療報酬データは加入者(調査コホート)と受療者(母数)が明確であり，かつ上記の臨床情報が時系列で得られるメリットがある．一方，医科レセプトで得られる情報には(薬局の調剤レセプトと異なり)，処方内容が 1 カ月単位でしか取得できない，あくまでも処方量であり服用量ではない，病名がいわゆる“レセプト病名”の可能性があり精度が十分ではない，などの制約がある．薬剤疫学研究では，このような利点と限界を踏まえながら診療報酬データを利用・解釈することになる．

本稿で紹介する著者らの調査は，日本医療データセンター(東京)に委託して抽出した診療報酬情報を得てデータセットとして用いた．複数の健康保険組合に加入している 0〜74 歳の勤労者およびその家族，計約 33 万名の被保険者の診療報酬データのなかから，医療機関を受診していずれかの向精神薬(睡眠薬，抗うつ薬，抗不安薬あるいは抗精神病薬)を処方された患者の診療情報を連結可能匿名化して抽出したものである．処方率については，本調査で対象とした健康保険組合加入者の性・年齢構成を 2005 年国勢調査の性・年齢別人口データおよび 2006 年，2007 年の推定総人口データを用いて補正し，一般人口における各向精神薬の 1 カ月処方率(毎月の処方率)および 3 カ月処方率(3 カ月に，すくなくとも 1 回処方される率)を算出した．また，各薬剤の処方量から各薬剤固有の等価換算値を用いて，処方力価をそれぞれ算出した．各薬剤の等価換算値は，日本国内のエキスパートが決定した既報データをもとにして設定した．睡眠薬は flunitrazepam，抗不安薬は diazepam，抗うつ薬は imipramine，抗精神病薬は chlorpromazine をそれぞれ基準薬とした．処方力価は，各年 3 カ月間の調査期間において各対象者の初処方月から 2 カ月間をウィンドウとして合計処方量を求め，1 日当りの処方力価を算出した．なお，etizolam については，日中投与を抗不安薬，眠前投与を睡眠薬として扱った．また，sulpiride については 300 mg 未満/day を抗うつ薬，300 mg 以上/day を抗精神病薬として扱った．

性別・年代層別の向精神薬の処方率

表 1 は，2005 年における各向精神薬の一般人口における 1 カ月および 3 カ月推定処方率を示したものである．日本国内では，向精神薬のなかでは抗不安薬の処方率がもっとも高く，ついで睡眠薬，抗うつ薬，抗精神病薬の順であった．図 1 では，2005〜2007 年にかけての各向精神薬の処方率の経年的推移を示してある．すべての向精神薬において処方率は増加しており，欧米諸国でのトレ

ンドと合致している．また，性別・年齢階層別での解析では，すべての向精神薬において男性に比較して女性での処方率が高いことが明らかとなっている．これは不眠症，うつ病，不安障害，重度ストレス反応，摂食障害など，向精神薬を処方される多くの精神疾患の罹患率が女性で高いことが一因であると推測される．

1．睡眠薬

著者らの調査で得られた睡眠薬の1カ月推定処方率は約2.6%であった．一方，2000年に行われた2つの自記式調査では，“過去1カ月間に，週3回以上眠るために何らかの薬を用いている”あるいは“過去1カ月間に，眠るために何らかの薬を用いている”者の頻度は男性で3.5～4.3%，女性で5.4～5.9%と若干高い値が報告されている[2,3]．ただし上記の2調査では睡眠薬の定義が異なるため，鎮静作用のある抗うつ薬や抗精神病薬，OTC，ハーブ類なども含まれている可能性があり，このことが睡眠薬の服用率を押し上げているものと考えられる．欧米での調査結果をみると，Kassamらは2002年にカナダ在住の18歳以上の約3万5千人を対象として実施されたCanadian Community Health Surveyでのデータを用いて，ATCコードに準じたベンゾジアゼピンおよび同様の効能を有する催眠・鎮静系薬物の男性および女性成人での調査時点での服用率を調査し，それぞれ2.5%および4.2%であったと報告している[4]．処方率は対象薬剤と調査組み入れ期間に大きく依存するため，サンプリング方法の異なる研究報告間で比較することは難しいが，著者らの調査で得られた調査データはこれら既報値と近似していた．北ヨーロッパにおける薬物処方実態を調査したNOMESCOによれば，1999～2003年にかけての北ヨーロッパ5カ国・3自治領全体における睡眠薬の処方率は顕著に増加している[5]．とくに，zolpidem，zopiclone，eszopiclone などのω1受容体選択性睡眠薬が登場して以降の睡眠薬処方率はより高くなったと推測される．日本国内では2000年にzolpidemが製造販売承認されて以降新薬がなかったが，2010年に新しいタイプの睡眠薬であるメラトニン受容体作動薬ramelteonが承認されたため，今後の睡眠薬の処方率に影響を与える可能性がある．

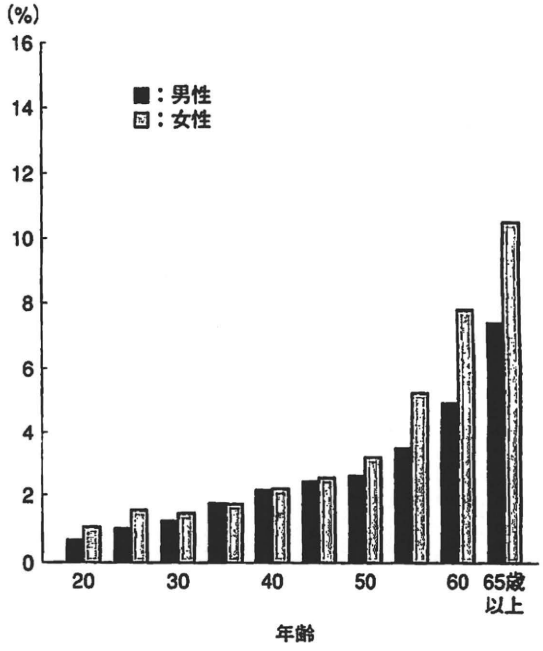

図2　睡眠薬の3カ月推定処方率(男女別)
横軸は5歳ごとの各年齢層を，縦軸は各年齢階層における3カ月推定処方率(%)を示す(文献[1]から2005年のデータをもとに作成)．

性別・年代層別の睡眠薬の処方率の解析から，睡眠薬の処方率は男性に比較して女性で高いことが明らかになった(3カ月処方率；3.02% vs. 4.29%，表1)．また，睡眠薬の処方率は男女ともに加齢にしたがって顕著に増加していた(図2)．過去の疫学研究では，不眠症の有病率は女性および高齢者で高いと報告されている．本研究の結果は，わが国における睡眠薬の処方動向もこれらの知見に合致していることを示している．同様に，日本[2]およびスウェーデン[6]で行われた睡眠薬の服用率調査でも，70歳代男性で約9～14%，女性で約12～23%，80歳代男性で10～22%，女性で22～35%であり，今回の調査結果と同様に加齢とともに服用率が上昇すること，女性で服用率が高いことが示されている．

高齢者層で睡眠薬の処方率が高いという現状は，臨床薬理学的な側面からも注意が必要である．一般的に，高齢者では睡眠薬の主流であるベンゾジアゼピン系薬物に対する感受性が亢進し，また薬物代謝能の低下から血中濃度が高まりやすい．

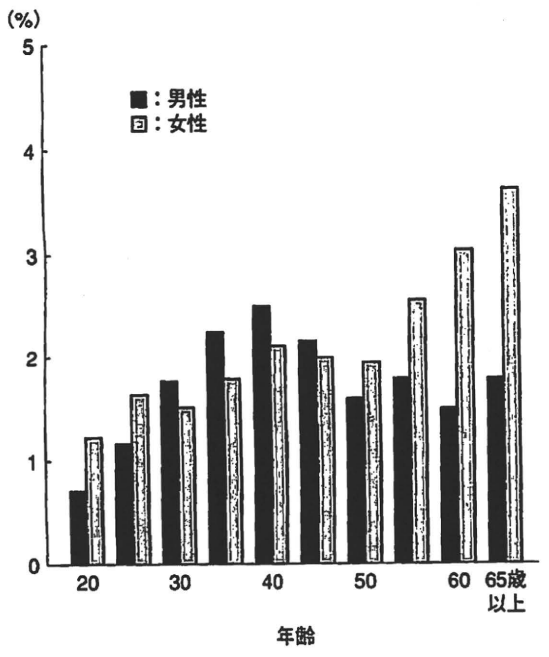

図 3　抗うつ薬の3カ月推定処方率(男女別)
横軸は 5 歳ごとの各年齢層を，縦軸は各年齢階層における 3 カ月推定処方率(%)を示す(文献[1]から2005 年のデータをもとに作成)．

その結果，ベンゾジアゼピン系薬物は，日中の眠気，認知機能低下，健忘，反跳現象，運動失調，めまいなどを引き起こしやすく，とくに高齢者において転倒や骨折などの重大な有害事象を引き起こす要因となるとされる[7-11]．高齢者に対するベンゾジアゼピン系睡眠薬の有用性に関するメタ解析では，60 歳以上の不眠高齢者に対するベンゾジアゼピン系睡眠薬の使用は，十分なリスク・ベネフィット比が担保されないことが指摘されている[12]．ベンゾジアゼピン系薬物のおもなユーザーである高齢者が同時に副作用のハイリスク者であることを認識し，今後は安全性の高い代替薬物や補完療法を開発する必要がある．

2. 抗不安薬

抗不安薬の処方率のトレンドは睡眠薬のそれと類似しており，男女ともに処方率は加齢にしたがって増加し，また中・高齢者では女性のほうが男性に比べて処方率が高い．抗不安薬の処方のなかで眠前投与はごく限られており，抗不安薬を睡眠薬代りに用いているケースの影響は限定的である．睡眠薬および抗不安薬の処方トレンドは，不安障害や不眠症などベンゾジアゼピン系薬剤の適応疾患の罹患年齢や性差に依存した特徴であると思われる．

3. 抗うつ薬

抗うつ薬の 3 カ月推定処方率は 2.02%であった．男女別では女性のほうが抗うつ薬の処方率が高かった(1.74% v. s. 2.27%)．これは，日本人におけるうつ病有病率は女性で高いという疫学研究の結果に合致している．抗うつ薬の使用量は先進諸国で顕著に増加しており[13-19]，欧米では成人人口の 8〜10%がすくなくとも過去 1 年間に抗うつ薬を服用しているとされる[14,18,19]．一方，日本では比較的低い処方率にとどまっており，同じアジア圏の先進国である台湾でもやはり 2.2〜4.4%と，日本と近似した処方率が報告されている[20]．日本ではセロトニン再取込み阻害剤(SSRI)，セロトニン・ノルアドレナリン再取込み阻害剤(SNRI)など，上市されている新規の抗うつ薬の種類が欧米に比較して極端に少ないこと，精神科受診に対するスティグマが強いなどの文化的な背景により，抗うつ薬の処方率が欧米での既報値より低い水準に止まっているものと推測される．

抗うつ薬の処方率は，男性ではうつ病の好初年齢である 20 代から処方率が増加し，働く世代である 40 代にピークがあり，50 代以降では低下傾向がみられた．女性では同様に 20 代から 40 代にかけて処方率が増加したが，60 代以降ではさらに増大し，男性の処方率を上まわる結果となった(図 3)．これまでの疫学調査では男性，女性ともに加齢に伴ってうつ病の有病率，自殺率は増大することが知られており，中高年男性で有病率が下がるということはない．したがって，50 歳以上の男性で抗うつ薬の処方率が低下していることは，何らかの事情により精神医療へのアクセスが乏しくなっている可能性が危惧される．この点については本研究で対象とした診療報酬データだけでなく，その他の要因を含めたより詳細な分析が必要である．

4. 抗精神病薬

抗精神病薬の処方率には加齢に伴う目立った変化はみられなかったが，65 歳以上の男性において処方率の上昇がみられた．この背景には統合失調症患者の高齢化だけではなく，認知症患者等に対

する off-label 投与がなされている結果と推測される．日本老年精神医学会の調査によれば，現在でも認知症患者の睡眠障害および夜間覚醒時に出現する徘徊や焦燥性興奮などの精神および行動障害(behavioral and psychological symptoms in dementia：BPSD)に対して定型的抗精神病薬が頻用されている．認知症患者でみられる BPSD は家族のもっとも切迫した訴えのひとつであるため治療者側の焦りを引き出し，薬物療法の効果に関して疑念があったとしても，BPSD に多少なりとも効果があればよしとする発想をもたらす．しかし，最近行われた複数のメタ解析によれば，すくなくとも定型的抗精神病薬の BPSD に対する効果は否定されており，また非定型抗精神病薬の効果もきわめて限定的であるとされている[21,22]．すなわち，睡眠障害のみならず BPSD に対しても，定型的抗精神病薬による薬物療法を支持するエビデンスは確立されていない．2005 年にはアメリカ FDA が，認知症患者に対する非定型抗精神病薬の使用が患者の生命予後を悪化させる危険性について勧告を出している（Public Health Advisory：Deaths with Antipsychotics in Elderly Patients with Behavioral Disturbances)[23]．非定形抗精神病薬の認知症患者の睡眠・行動障害に対する治療研究はいまだ数が限られており，今後の大きな検討課題である．

向精神薬の処方力価

表 2 に各向精神薬の 1 日当り処方力価を示した．患者全体での平均処方力価は，ほぼ臨床的な推奨用量に近似していることがわかる．また，すべての向精神薬で男性患者での処方力価は女性患者でのそれよりも高値であった．性別・年齢階層別に解析した結果では睡眠薬，抗不安薬，抗うつ薬ではいずれも 40 代前後に処方力価のピークが存在し，50 代以降の中高年患者に対する処方力価はやや低下する傾向がみられた．抗不安薬においては女性，抗うつ薬では男性の高齢者で 1 日当りの処方力価がピークの年代の約 2/3 までに減量されていた．抗精神病薬では特定の年齢階層をピークとする分布はみられなかったが，男女ともに 65 歳以上の高齢者で処方力価が低下していた．処方力価の性差では，抗うつ薬の処方力価が 20 代から 40 代の男性患者において，女性患者に比較してより高力価処方がなされていたが，55 歳以降では男女の差はみられなかった．そのほかの向精神薬では顕著な性差はみられなかった．

表 2　向精神薬の1日当り処方力価

向精神薬	性別	処方力価
睡眠薬	男性	1.00
	女性	0.92
	全体	0.96
抗うつ薬	男性	86.53
	女性	66.89
	全体	78.22
抗不安薬	男性	5.06
	女性	4.40
	全体	4.72
抗精神病薬	男性	227.6
	女性	249.2
	全体	239.1

1 日当り処方力価：初処方月から 2 カ月間における 1 日当りの平均処方力価．
睡眠薬は flunitrazepam，抗不安薬は diazepam，抗うつ薬は imipramine，抗精神病薬は chlorpromazine をそれぞれ基準薬とした．

向精神薬の処方診療科

図 4 に日本国内における各向精神薬のおもな処方診療科の内訳を示した．睡眠薬処方件数全体に占める精神科・心療内科での処方割合は約 4 割に止まり，半数以上は一般身体科からの処方であることがわかる．同様の傾向は抗不安薬にも認められた．一方，抗うつ薬，抗精神病薬はそれぞれおよそ 6〜7 割が精神・心療内科から処方されている．さらに各年代層での処方診療科の解析によれば，睡眠薬および抗不安薬では 20〜40 代で精神科・心療内科からの処方のピークがみられたが，加齢に伴って一般身体科からの処方が増加し，男女とも 65 歳以上では約 8 割が一般身体科からの処方であった．抗うつ薬でも 20〜40 代では約 7 割以上が精神科・心療内科からの処方であったが，男女ともに高齢者になると一般身体科からの処方が増加していた．

併存疾患と向精神薬処方

一般身体科において睡眠薬・抗不安薬の処方頻

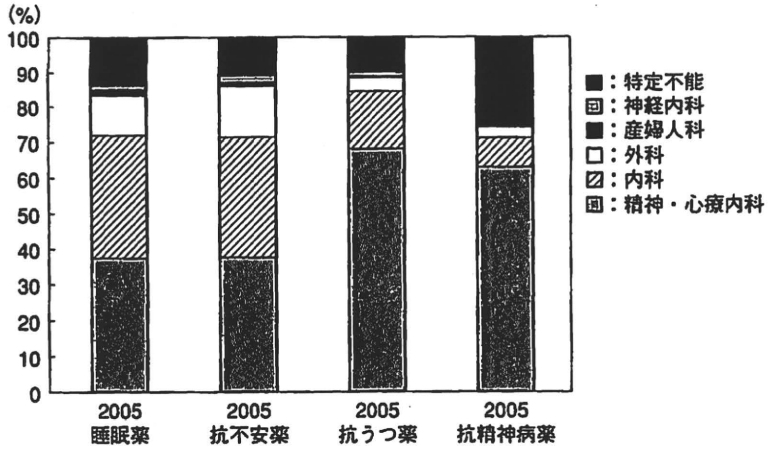

図 4　各向精神薬のおもな処方診療科の内訳
文献[1]から 2005 年のデータをもとに作成.

度が高い背景には，ベンゾジアゼピン系薬物を主流とする睡眠薬・抗不安薬は一般的に安全域も大きく処方しやすい薬物であることに加え，両薬剤の処方対象となる不眠，神経症性障害，ストレス関連障害，身体表現性障害などは一般人口中の有病率が高く，また身体疾患と併存する頻度が高いことがあげられる．実際，著者らの調査でも睡眠薬・抗不安薬の処方率は，合併身体疾患数に伴って顕著に増加していた．一方，抗うつ薬や抗精神病薬の大部分はうつ病や統合失調症患者に対して使用されるため，精神科や心療内科など向精神薬に関してより専門性の高い診療科で処方される傾向が強いものと推測される．

おわりに

本稿では著者らが行った厚生労働科学研究事業での薬剤疫学研究データをもとに，日本国内における向精神薬の処方実態について紹介した．現在，2009 年までのデータを収集しており，2011 年中に直近 5 年間の処方トレンドを解析して速報値として公開する予定である．日本国内での向精神薬の処方率は欧米諸国と同様に増加しており，一部の向精神薬は精神科・心療内科に限らず，むしろ一般身体科での使用頻度が高い．また，高齢者や身体合併症を有する有害事象の生じやすいハイリスク患者でも高頻度に処方されている実態が明らかになった．しかし，向精神薬のリスク・ベネフィットや薬物相互作用に関する臨床薬理情報は，いまだ不足しているのが現状である．向精神薬の適正使用に関するガイドラインの整備に向けて，安全性に優れた治療ストラテジーや長期処方を回避するための減薬方法などに関する臨床試験を推進する必要性が改めて示されたといえる．

文献/URL

1) 三島和夫：高齢者に対する向精神薬の使用実態と適切な使用方法の確立に関する研究．厚生労働科学研究費補助金・長寿科学総合研究事業「高齢者に対する向精神薬の使用実態と適切な使用方法の確立に関する研究」平成 20 年度総括・分担研究報告書，2009，pp.5-19.
2) Doi, Y. et al.：Prevalence of sleep disturbance and hypnotic medication use in relation to sociodemographic factors in the general Japanese adult population. *J. Epidemiol.*, 10(2)：79-86, 2000.
3) Kaneita, Y. et al.：Use of alcohol and hypnotic medication as aids to sleep among the Japanese general population. *Sleep Med.*, 8(7-8)：723-732, 2007.
4) Kassam, A. and Patten, S. B.：Hypnotic use in a population-based sample of over thirty-five thousand interviewed Canadians. *Popul. Health Metr.*, 4(15)：15, 2006.
5) NOMESCO, Health Statistics in the Nordic Countries. http://nomesco-eng.nom-nos.dk/
6) Asplund, R.：Sleep and hypnotics among the elderly in relation to body weight and somatic disease. *J. Intern. Med.*, 238(1)：65-70, 1995.
7) Hemmelgarn, B. et al.：Benzodiazepine use and the risk of motor vehicle crash in the elderly [see comments]. *JAMA*, 278(1)：27-31, 1997.
8) Morgan, K.：Hypnotics in the elderly. What cause for concern? *Drugs*, 40(5)：688-696, 1990.
9) Ray, W. A. et al.：Benzodiazepines and the risk of falls in nursing home residents. *J. Am. Geriatr. Soc.*, 48(6)：682-685, 2000.