INTRODUCTION

Insomnia is a common sleep disorder. The reported prevalence of insomnia in the general population varies widely, ranging between 4.4% and 48%, depending on sample characteristics and the definition of insomnia.[1-4] Chronic insomnia not only reduces the quality of sleep during the night, but also causes a variety of impairments in mental and physical functioning during the daytime.[5-10] Chronic insomnia is associated with both human and socioeconomic costs, such as increased long-term absenteeism at work, reduced performance and productivity, and increased industrial accidents and health-care costs.[11-16] Moreover, alongside insomnia being the most common symptom of depression,[17-21] persistent insomnia is a risk or exacerbating factor of depressive disorders.[22-27]

Factors leading to the onset and worsening of insomnia are multidimensional in nature,[28] and many life events and life stresses can result in acute insomnia.[28-30] Based on the 3P model proposed by Spielman that is widely used to explain the onset mechanism of insomnia,[31] three factors (predisposing, precipitating, and perpetuating) are closely linked to insomnia development. With underlying predisposing factors (including age, sex, genetic disposition, and lifestyle), insomnia emerges as precipitating factors (stressful life events such as divorce, pain, and psychological and physical problems) are superimposed, and the insomnia becomes chronic and difficult to treat because of perpetuating factors (maladaptive sleep hygiene practices, dysfunctional cognition about sleep loss and its impact on life).[23,31-34]

Inadequate stress coping behavior also precipitates insomnia, and heightens uneasiness and tension around being unable to sleep, thereby perpetuating the sleeplessness.[7,8,35] Further, insomniacs may often engage in poor sleep hygiene, such as having an inadequate sleep environment, lack of daytime activities, and excessive afternoon napping.[7,8,30-35] It is reported that the majority of people with insomnia attempt to cope with sleep problems in various ways,[36] have fewer adaptive coping skills, rely more on emotion-focused coping strategies than on problem-solving strategies,[37] and report lower feelings of mastery.[24,38-40] Although reduced quality of life associated with insomnia has been reported in a general population sample,[9,10,32] few studies have examined specific daily behaviors and practices of people with insomnia.

The aims of this study are: (i) to investigate the prevalence of insomnia during the past one month associated with daytime impairments among Japanese adults; and (ii) to examine how insomnia and comorbid depression are associated with stress coping behaviors (SCBs) and sleep hygiene practices (SHPs), using data of a representative sample from a large-scale epidemiological study on sleep habits and their correlates.

MATERIALS AND METHODS

Data source

The present study was conducted using partial data from the Active Survey of Health and Welfare performed in June 2000 by the Ministry of Health, Labour and Welfare. The purpose of the survey was to collect basic data on health and welfare, including sleep habits, from the general public of Japan. To provide a representative sample of the general population, the survey was conducted through public health centers in 300 target areas randomly selected from the 881 851 national census areas nationwide. Participants were household members aged ≥12 years, all Japanese. Survey officials for home visits were employed part-time and trained as research associates by public health centers across Japan during this time. For data collection, these research associates visited each participating household to distribute self-administered questionnaires and collect them a few days later.

All survey respondents provided verbal informed consent to participate. Their privacy was protected in accordance with the Declaration of Helsinki guidelines.

Measures

The self-administered questionnaire for the present study was developed by two of the authors (MU and TO.) and an appropriate official from the Ministry of Health, Labour, and Welfare. The self-administered questionnaire consisted of 44 items covering: (ii) socio-demographic characteristics including age and sex; (ii) general health status; (iii) physical and psychological complaints; (iv) information on mental stress; (v) sleep habits and problems; and (vi) Center for Epidemiologic Studies Depression Scale (CES-D) Japanese version.[41]

To examine factors associated with 1-month insomnia and determine whether stress was present, one item ("Have you experienced stress in your daily life during the last one month period?") was extracted from the 44 items on the self-administered questionnaire. Seven items related to mental stress were extracted from the question "What do you do to deal with insomnia, worries, difficulties, and/or stress?" Five items related to sleep habits and problems were extracted from the

question "Have you tried to do any of the following during the last one month period to get enough sleep?" The CES-D is a self-report scale designed specifically to measure depressive symptomatology in the general population during the previous week-long period[42] and has appropriate levels of reliability and validity for use with a general population. Each item is rated on a scale of 1 to 3 points, and the result is evaluated based on the total score for all 20 items (range 0 to 60 points). Higher scores indicate increased severity of depression. This scale is designed to screen, not to diagnose, major depression. The reliability and validity of the CES-D Japanese version has been reported in Japan.[41]

Case definition of insomnia

Based on an algorithm that combined the general criteria of insomnia in ICSD-2[43] and the diagnostic criteria of primary insomnia in DSM-IV,[44] we first selected cases reporting the presence of both insomnia symptoms and physical/psychological complaints during the past one month, identified based on the responses to the survey questionnaire about sleep problems and daytime functioning during the past one month. Then we excluded cases reporting a common comorbid sleep disorder (sleep-disordered breathing and restless leg syndrome). Therefore, people with insomnia were defined here as individuals who reported all of the following.

A) *Sleep problems.* We determined a respondent had insomnia symptoms when reporting any of the following items occurring or persisting during the past one month: "difficulty falling asleep," "waking up frequently during the night," "waking up early in the morning," and "getting up in the morning feeling unrefreshed or not restored (nonrestorative sleep)."

B) *Daytime impairments.* We determined that a respondent had daytime impairments when reporting any of 6 physical complaints (head-heaviness/headache, gastric discomfort, diarrhea/constipation, shoulder/neck stiffness, fatigability, and residual fatigue) or 5 psychological complaints (depression, irritability, anxiety, hypochondria, and daytime sleepiness), which are common symptoms of insomnia,[43] occurring or persisting during the past one month.[44]

C) *No comorbid sleep disorder.* We excluded cases with comorbid sleep-disordered breathing or restless legs syndrome, which are also common in the general population. We excluded respondents reporting either "waking up during the night due to loud

snoring and breathing difficulty" or "feeling a crawling sensation deep inside my legs" occurring or persisting during the past one month.

Case definition of insomnia comorbid with depression

We defined the presence of depression as a score of ≥26 (range 0–60) on the 20-item CES-D Japanese version. Studies in West European countries indicate that a score of ≥16 is indicative of probable clinical depression,[42] but we set the cutoff score for depression at 26 according to the criterion used by national census studies conducted in Korea[45] and Japan.[46] Among the respondents of the Active Survey of Health and Welfare, 8.1% scored ≥26 on the CES-D, which was close to the 12-month prevalence of mood disorders based on the DSM criteria (6.8%) obtained in a community survey conducted between 2002 and 2003 in Japan.[47] We defined "people with insomnia comorbid with depression" as those who had 1-month insomnia and scored ≥26 points on the CES-D Japanese version.

Stress coping behaviors (SCBs)

Respondents were asked to answer the following questions: "Do you use the following coping behaviors when you feel dissatisfied or distressed, or experience problems or stress?" (yes = 1, no = 0). They indicated if each of the following 7 items describing everyday stress coping behaviors applied to them: (i) "Making an effort to solve the problems actively [Problem-solving];" (ii) "Making plans to take time off [Time off];" (iii) "Eating something [Eating]," (iv) "Watching TV/ Listening to the radio [TV/Radio];" (v) "Taking it easy [Ease];" (vi) "Smoking [Smoking];" and (vii) "Bearing the stress without taking any action [Bearing]."

Sleep hygiene practices (SHPs)

Respondents were asked to answer the following questions: "Did you engage in any of the following practices in the past one month in order to sleep well?" (yes = 1, no = 0, except for the first item). They indicated whether each of the following 5 items describing everyday sleep hygiene practices applied to them: (i) "Drinking alcohol [Alcohol];" (ii) "Taking light exercise [Exercise];" (iii) "Taking a bath [Bath];" (iv) "Reading books/Listening to music [Books/Music];" and (v) "Trying to have regular daily habits [Regularity]."

Table 1 Demographic characteristics of analyzed subjects in a sample of the Japanese adult general population ($n = 24\,551$)[†]

Age class (years)	Study subjects			Census 2000 ($n = 100\,733\,618$)	
	Subtotal % (n)	Male % (n)	Female % (n)	Male %	Female %
20–29	18.2 (4468)	18.4 (2145)	18.0 (2323)	19.1	17.2
30–39	18.4 (4508)	18.4 (2152)	18.3 (2356)	17.5	16.1
40–49	18.8 (4606)	19.2 (2249)	18.3 (2357)	17.2	16.0
50–59	20.5 (5036)	21.0 (2453)	20.0 (2583)	19.5	18.6
60–69	14.0 (3436)	14.5 (1691)	13.6 (1745)	14.6	14.9
≤70	10.2 (2497)	8.5 (999)	11.6 (1498)	12.1	17.4
Total	100 (24551)	100 (11689)	100 (12862)	100	100

[†]Data for both the present study and the overall census were obtained in 2000.

Respondents rated the item [Alcohol] on a 4-point scale: "None," "1–2 times per month," "1–2 times per week," and "more than 3 times per week." On this item, we coded "1–2 times per week" and "more than 3 times per week" as "yes."

Presence of stress

Respondents were asked to answer the following question: "Did you feel dissatisfied or distressed, or experience any difficulties or stress during the past one month?" They answered this question on a 4-point scale: "much," "some," "little", and "none." In our study, "much" was coded as "yes" and the other response choices were coded as "no" (yes = 1, no = 0).

Statistical analysis

The prevalence of insomnia and prevalence of insomnia comorbid with depression were compared by sex and age group, using chi-square tests. Associations between individual SCB and SHP factors and insomnia (or comorbid with depression) were examined. Logistic regression analyses were performed to identify associations between each factor and 1-month insomnia.

Sex, age group – younger (20–39), middle-aged (40–59), and old-aged (≥60) – and presence of stress were entered into the regression models to adjust for the confounding effects of sociodemographic and other factors. Odd ratios (ORs) were calculated from both the univariate analyses and the multivariate logistic regression analysis with 95% confidence intervals. Statistical significance was set at $P < 0.01$. All analyses were performed using SPSS 11.5 for Windows (SPSS Inc, Chicago, IL, USA).

RESULTS

Sample characteristics

A total of 32 729 people completed the survey questionnaire. We limited the sample to adults aged ≥20 years and further excluded those with any missing data for the variables included in our analysis. Before conducting analyses, data from 707 participants were excluded for submitting blank survey sheets. Minors aged <20 years ($n = 3284$) were excluded because this study focused on adults. Additionally, data from respondents who did not answer questions regarding sex and age ($n = 208$) and data from those who did not answer >6 items on the CES-D were excluded ($n = 3979$). Thus, the final sample for analysis comprised 24 551 adults: 11 689 (47.7%) men and 12 862 (52.3%) women, with a mean age of 47.1 years (range 20–100 years). Demographic data of the study sample are shown in Table 1.

Compared with the national census data collected around the same time, our study sample included a smaller proportion of adults aged ≥70, but the rates for the other age groups were similar. The national census data were based on all residents of Japan on October 1, 2000, and Table 1 indicates that our study sample was a representative sample of the general population of Japan. Because the total number of residents recruited in each target area was not made public by the Ministry of Health, Labour and Welfare, we were unable to compute the response rate. The Active Surveys of Health and Welfare conducted 3, 4, and 6 years prior to 2000 had response rates of 87.1%, 89.6%, and 87.3%, respectively. Since the methodology of the survey has remained the same over the years, we postulated that the response rate for our study sample was similar to those from previous surveys.[46]

Table 2 Presence of insomnia and insomnia comorbid with depression, by age group and sex

Age class (years)	Insomnia			Insomnia comorbid with depression		
	Subtotal % (n)	Male % (n)	Female % (n)	Subtotal % (n)	Male % (n)	Female % (n)
20–29	37.1 (1661)	33.4 (716)	40.7 (945)	5.6 (252)	4.9 (106)	6.3 (146)
30–39	41.7 (1881)	38.8 (834)	44.4 (1047)	4.4 (198)	3.3 (72)	5.3 (126)
40–49	41.5 (1911)	42.3 (953)	40.6 (958)	5.1 (236)	4.5 (102)	5.7 (134)
50–59	45.5 (2290)	45.1 (1107)	45.8 (1183)	5.0 (253)	4.6 (112)	5.5 (141)
60–69	48.1 (1653)	46.1 (780)	50.0 (873)	4.5 (155)	4.6 (78)	4.4 (77)
≤70	50.3 (1257)	48.8 (488)	51.3 (769)	10.5 (263)	9.0 (90)	9.8 (173)
Total	43.4 (10653)	41.7 (4878)	44.9 (5775)†	5.5 (1357)	4.8 (560)	6.2 (797)†

†Significant difference between men and women ($P < 0.001$, chi-square test).

Prevalence of insomnia

Prevalence of insomnia in the study sample by sex and age group is summarized in Table 2. In the entire sample, the prevalence was 43.4% ($n = 10\ 653$). The rate was significantly higher in women than in men: 44.9% (5775/12 862) versus 41.7% (4878/11 689), $\chi^2 = 25.02$, $P < 0.001$. The prevalence comorbid with depression (i.e. people with insomnia who scored ≥26 on the CES-D Japanese version) was 5.5% ($n = 1357$) of the entire sample and 12.7% of the sample of people with 1-month insomnia. The prevalence was significantly higher in women than in men: 6.2% (797/12 862) versus 4.8% (560/11 689), $\chi^2 = 23.17$; $P < 0.001$.

Percentage of SCBs and SHPs

The frequencies of each SCB and SHP item among people with insomnia and insomnia comorbid with depression are shown in Table 3.

SCB factors associated with insomnia

Table 3 shows the SCB factors associated with insomnia and their ORs. In multivariable logistic regression, incidence was significantly positively associated with four SCB factors: Bearing (OR = 1.69), Smoking (OR = 1.26), Eating (OR = 1.22), and TV/Radio (OR = 1.18), all $P <$ 0.01. Conversely, Problem-solving was the only SCB with a significantly negative correlation (OR = 0.87). Time off and Ease showed no significant association.

SHP factors associated with insomnia

Table 3 also shows the SHP factors associated with insomnia and their ORs. In multivariable logistic regression, insomnia was significantly positively associated with three of the SHP factors: Alcohol (OR = 1.27), Books/Music (OR = 1.24), and Bath (OR = 1.09), all $P < 0.01$. Regularity and Exercise were not significantly correlated. None of the SHPs was negatively correlated.

SCB factors associated with insomnia comorbid with depression

Table 3 shows the SCB factors associated with insomnia comorbid with depression and their odds ratios. Multivariate logistic analysis showed the following four SCB factors had significant positive relations with insomnia comorbid with depression in descending order: Bearing (OR = 3.44), Smoking (OR = 1.73), TV/Radio (OR = 1.52), and Eating (OR = 1.51). Conversely, SCB factors with significant negative relations with insomnia comorbid with depression included Problem-solving (OR = 0.50) and Ease (OR = 0.74). Time off was not significantly related to insomnia comorbid with depression.

SHP factors associated with insomnia comorbid with depression

The SHPs associated with insomnia comorbid with depression and their odds ratios are also shown in Table 3. Multivariate logistic analysis showed insomnia comorbid with depression was significantly and positively related only to Books/Music (OR = 1.36). Conversely, the only factor with a significant negative relationship with insomnia comorbid with depression was Regularity. The individual factors of Alcohol, Bath, and Exercise showed no significant relationship with incidence comorbid with depression.

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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,

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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 non-photic 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 psycho-behavioral 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

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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

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◎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
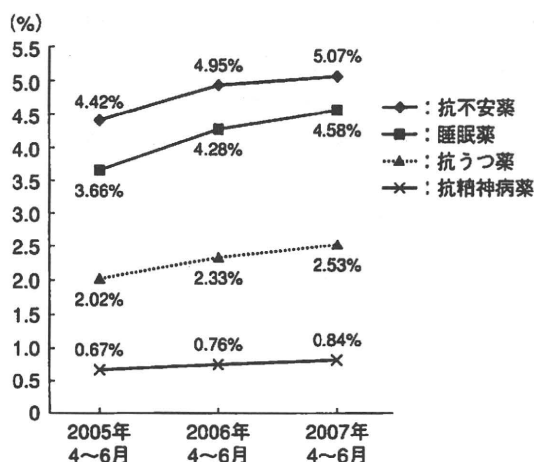
率)を算出した. また, 各薬剤の処方量から各薬剤固有の等価換算値を用いて, 処方力価をそれぞれ算出した. 各薬剤の等価換算値は, 日本国内のエキスパートが決定した既報データをもとにして設定した. 睡眠薬はflunitrazepam, 抗不安薬はdiazepam, 抗うつ薬はimipramine, 抗精神病薬はchlorpromazineをそれぞれ基準薬とした. 処方力価は, 各年3カ月間の調査期間において各対象者の初処方月から2カ月間をウィンドウとして合計処方量を求め, 1日当りの処方力価を算出した. なお, etizolamについては, 日中投与を抗不安薬, 眠前投与を睡眠薬として扱った. また, sulpirideについては300mg未満/dayを抗うつ薬, 300mg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
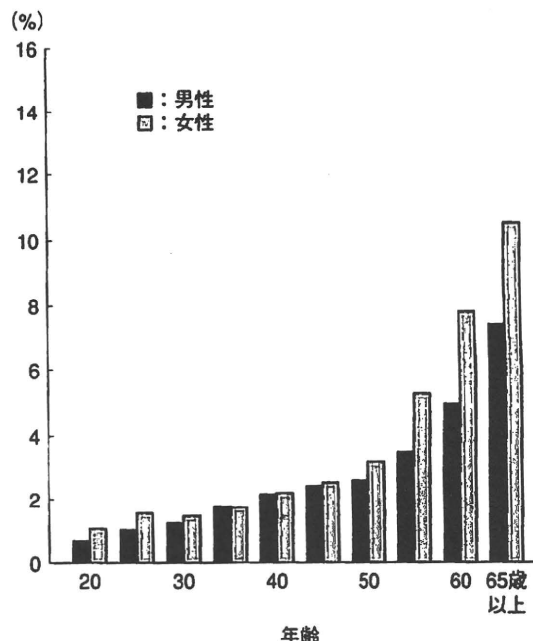

図2 睡眠薬の3カ月推定処方率（男女別）
横軸は5歳ごとの各年齢層を，縦軸は各年齢階層における3カ月推定処方率（％）を示す（文献[1]から2005年のデータをもとに作成）．

性がある．

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．

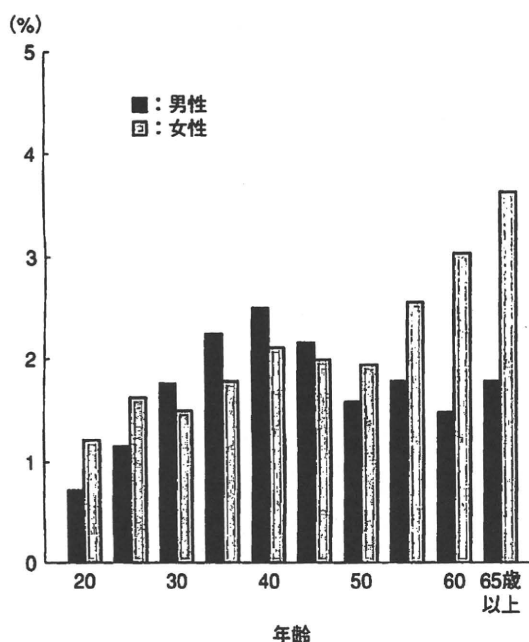高齢者層で睡眠薬の処方率が高いという現状は，臨床薬理学的な側面からも注意が必要である．一般的に，高齢者では睡眠薬の主流であるベンゾジアゼピン系薬物に対する感受性が亢進し，また薬物代謝能の低下から血中濃度が高まりやすい．

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

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．

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．

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．
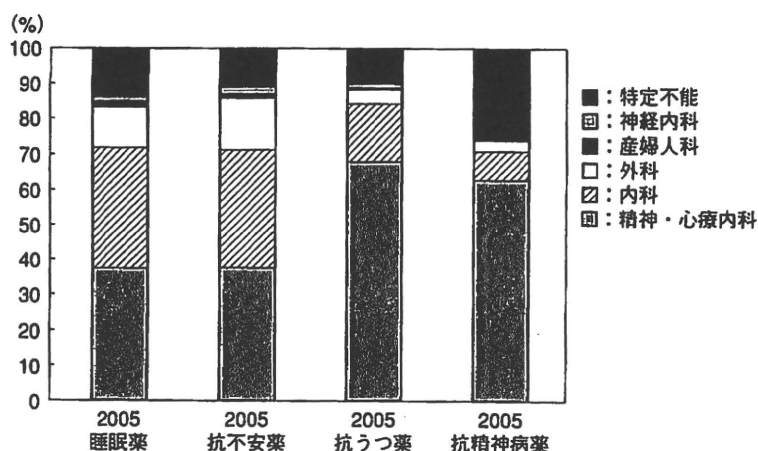
併存疾患と向精神薬処方

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.

凡例:
■：特定不能
回：神経内科
■：産婦人科
□：外科
▨：内科
回：精神・心療内科

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．

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