Industrial Health 2011, **49**, 452–463 **Original Article**

Mental Health, Suicidal Ideation, and Related Factors among Workers from Medium-sized Business Establishments in Northern Japan: Comparative Study of Sex Differences

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Received October 30, 2010 and accepted January 19, 2011
Published online in J-STAGE June 21, 2011

Abstract: A questionnaire survey was conducted among 3,233 workers (2,442 males and 791 females) from 17 medium-sized business establishments in northern Japan with respect to GHQ-12 score, suicidal ideation, sociodemographic characteristics, work-associated factors, and attitude toward mental health resources. Sex differences were assessed for each questionnaire item, and logistic regression analyses were performed separately for males and females. Significant correlations between common mental disorder (CMD: GHQ-12 score≥3) and the following factors were found for both sexes: short sleep, irregular working schedule, working in specific businesses, and attitude toward mental health resources. Associations between CMD and excess workload were significant only in male workers. While correlations between suicidal ideation and demand for mental health resources were observed in both sexes, significant correlations were observed between suicidal ideation and use of mental health resources for female workers alone. These results suggest that screening of a high-risk population and provision of mental health resources contribute to suicide prevention as a part of mental health promotion measures in medium-sized business establishments. They also suggest the need for identification of business/job type-specific stressors while considering sex differences in lifestyle factors, working environment, and help-seeking behavior.

Key words: GHQ-12, Common mental disorder, Suicidal ideation, Occupational mental health, Medium-sized business establishments, Work-associated factors, Sex differences, Help-seeking behavior

Introduction

Japan's high suicide rate is internationally recognized[1)], with an annual number of suicide deaths exceeding 30,000 since 1998[2)], and the rate of suicide in northern Japan is higher than in other regions in Japan[2)]. Multiple factors have been reported as reasons for this regional difference, such as depopulation, insufficient medical resources, and economic disadvantage[3)]. Working people accounted for about one-third of suicide death[2)], and about two-thirds of suicide deaths are male not only in Japan[2)] but in nearly all countries[1)]. In contrast, other suicide-related behaviors such as suicidal ideation[4)] and suicide attempts[5, 6)] are more common in females. This discrepancy may be related to behavioral differences between males and females[6–8)], and investigations focusing on sex differences could contribute to measures against mental health problems.

There is concern over worsening of the working environment due to the recent deterioration in economic conditions[9)], and approximately 60% of the working population has strong anxiety or stress related to their work[10)]. New guidelines for mental health promotion

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measures for working people have been published as part of the Revised Industrial Safety and Health Act in Japan[11], and have been strenuously implemented in large business establishments with 1,000 or more permanent employees[12]. Employees of these large-sized business establishments account for less than 5% of the entire working population[13]. Although medium-sized business establishments with 50–999 permanent employees account for about 30% of the entire working population[13], adequate mental health promotion measures have not been implemented in them[12]. Previous studies regarding occupational mental health and suicide-related behaviors conducted in Japan have exclusively involved workers from large-sized business establishments[14], a single business type[8, 15, 16], civil servants[17–19], or depressed population-specific surveys[8, 16, 20–22].

The present study aimed to clarify the general mental health status, suicidal ideation, and related factors of workers from 17 medium-sized business establishments in northern Japan, and compared findings between male and female workers.

Subjects and Methods

Subjects and procedure

Eighteen business establishments operating in northern Japan were included in this study. Excluding one small-sized business establishment with fewer than 50 permanent employees, the other 17 business establishments were medium-sized, with 50–999 permanent employees. The types of business included construction, information and communication, manufacturing, combined services, retail trade, and medical welfare. A total of 4,804 employees from the 18 business establishments were included in the study population, and an anonymous self-administered questionnaire survey of them was conducted in January 2008.

Questionnaire forms were mailed to the general affairs department of each business establishment, which distributed a letter explaining the purpose of the survey and the questionnaire form to each employee via managers of each section. For ethical reasons, a document describing the purpose of the study, including the statement that participation in the survey is voluntary, and privacy protection-related issues, such as anonymity, was distributed along with the questionnaire form, and consent to participate in the survey was determined by return of a completed questionnaire form in an individual sealed envelope.

Responses were obtained from 3,944 workers (2,888 males and 1,018 females), yielding a response rate of 82.1%. From them, 711 respondents (446 males and 227 females), including those who were working at small-sized business establishments and those who failed to complete all questionnaire items, were excluded, and the resulting 3,233 respondents (2,442 males, mean age 40.47 ± 11.42 yr; and 795 females, mean age 38.71 ± 10.53 yr; accounting for 67.3% of the entire population) from medium-sized business establishments were included in the analysis.

Questionnaire

Survey items included sociodemographic characteristics, including sex, age, marital status, living condition, frequency of alcohol use, alcohol consumption per occasion, and sleep duration, as well as work-associated factors, including type of business, type of job, employment status, years of continuous employment, working hours distribution, days taken off work, overtime work, working schedule irregularity, and shift work. Short sleepers were defined as those with a sleep duration of less than 6 h, as described previously[23]. The Japanese 12-item version of the General Health Questionnaire (GHQ-12)[24–26] was used as a mental health scale. The GHQ method (0-0-1-1 point allocation) was used for the GHQ-12. According to a previous study in which those with a GHQ-12 score of 3 points or more were defined as having a common mental disorder (CMD)[26, 27], those with a GHQ-12 score of 3 points or more were defined as the CMD group, while those with a score of 2 points or less comprised the good GHQ group. With regard to suicidal ideation, a subscale item adopted from the Zung Self-rating Depression Scale (SDS)[28] asking if subjects had ever had the thought, "I feel that others would be better off if I were dead", was used and respondents who selected "Good part of the time" or "Most of the time" were defined as having suicidal ideation, while those who selected "A little of the time" or "Some of the time" were considered not to have suicidal ideation.

Regarding the demand for mental health resources, respondents were asked to answer the question, "Are you in need of consultation with a mental health specialist?" by selecting from among four options. Those answering "Yes, to some extent" or "Definitely yes" were included in the "necessary" group, while those answering "Not at all" or "For the most part no" were considered the "unnecessary" group. With regard to experience of mental health resources use, respondents were given examples of internal or outside mental health resources and asked whether they had used any of them. Answers of "Having used at least one of them" were defined as "yes", while those of "Having used none of them" were defined as "no".

Statistical analysis

Each survey item was first compared between males and females. Categorized variables were analyzed using the χ^2 test and continuous variables were analyzed using the *t*-test. To identify factors contributing to development of CMD and suicidal ideation separately in males and females, univariate analysis was performed for each factor with CMD (CMD (1) and non-CMD (0)) and suicidal ideation (suicidal ideation (1) and no suicidal ideation (0)) as dependent variables and each survey item as an explanatory variable (CMD: sociodemographic characteristics, work-associated factors, demand for mental health resources, and use of mental health resources, suicidal ideation: above-mentioned factors and CMD). Factors found to be associated with a significant difference ($p<0.05$) in univariate analysis were then subjected to multivariate stepwise logistic analysis. All analyses were performed using SPSS version 16.0J for Windows, with a significance level of 5% for all tests. Significance probabilities were expressed as numerical values.

Results

Sociodemographic characteristics and work-associated factors (Table 1)

The mean age of female respondents was significantly lower than that of male respondents. A significant sex difference was found in the distribution of marital status and living condition. There was significantly more frequent use and more consumption of alcohol per occasion by males than by females. We found no significant sex difference in the percentage of short sleepers.

Respondents were engaged in various types of business, including construction, information and communication, manufacturing, combined services, retail trade, and medical welfare, with a significant sex difference in the distribution. The percentages of those in administrative positions and the percentages of full-time employees were significantly higher for males than for females. A significant sex difference was also found in the distribution of years of continuous employment, though no significant sex difference was observed with respect to distribution of working hours. Percentages of those taking few days off of work, doing overtime work, and working irregular schedules were significantly higher for male than for female respondents, while the percentage of individuals performing shift work was significantly higher for female than for male respondents.

GHQ-12 score, attitude toward mental health resources, and suicidal ideation (Table 2)

The mean GHQ-12 score was 2.28 ± 3.12 for all respondents. The CMD group included 31.4% of all males and 33.5% of all females. Both mean GHQ-12 score and CMD prevalence were slightly higher in females than in males, though not significantly so.

There was no significant sex difference in demand for mental health resources, while the percentage of those who had used them was significantly lower for male respondents.

A total of 114 (3.5%) respondents, including 82 (3.4%) males and 32 (4.0%) females, were found to have suicidal ideation. No significant sex difference was found in the distribution of responses to the question about suicidal ideation.

Logistic regression analysis (Tables 3–6)

The following ten factors were selected as significantly contributing to the development of CMD in male respondents (Table 3): consuming alcohol once per week (OR=0.626); short sleep duration (OR=1.971); working in manufacturing (OR=1.722), combined services (OR=2.404), or retail trade business (OR=1.828); taking 4 or fewer days off work per month (OR=1.431); having 45 h or more of overtime work per month (OR=1.731); working irregular schedules (OR=1.612); need for mental health resources (OR=3.793); and having used mental health resources (OR=1.438). For female respondents, the following eight factors significantly contributing to the development of CMD were selected (Table 4): short sleep duration (OR=1.748); working in manufacturing (OR=1.849), combined services (OR=2.157), or retail trade business (OR=3.355); having worked for 10–19 yr continuously (OR=0.625); working irregular schedules (OR=2.218); need for mental health resources (OR=5.023); and having used mental health resources (OR=1.929).

The following four factors were selected as significantly contributing to the development of suicidal ideation in male respondents (Table 5): being single (OR=2.982), working in combined services business (OR=3.107), need for mental health resources (OR=2.516), and CMD (OR=6.091). For female respondents, the following three factors were selected as significantly contributing to the development of suicidal ideation (Table 6): need for mental health resources (OR=3.658), having used mental health resources (OR=3.141), and CMD (OR=6.980).

Discussion

The present study revealed differences between males and females in both socio-demographic characteristics and work-associated factors among workers, particularly excess workload and alcohol drinking. This probably

Table 1. Sociodemographic characteristics and work-associated factors

		Male (n=2,442) n (%)	Female (n=791) n (%)	*p* value
Age (yr)				<0.001
	18–29	414 (17.0)	178 (22.5)	
	30–39	843 (34.5)	267 (33.8)	
	40–49	499 (20.4)	195 (24.7)	
	≥50	686 (28.1)	151 (19.1)	
	Mean ± SD	40.47 ± 11.42	38.71 ± 10.53	<0.001*
Marital status				<0.001
	Married	1,674 (68.6)	454 (57.4)	
	Single	699 (28.6)	244 (30.8)	
	Divorced/bereaved	69 (2.8)	93 (11.8)	
Living condition				<0.001
	Living with own family	1,895 (77.6)	677 (85.6)	
	Living alone	336 (13.8)	90 (11.4)	
	Other	211 (8.6)	24 (3.0)	
Frequency of alcohol use				<0.001
	Never drink	308 (12.6)	239 (30.2)	
	Drank before, but now don't	91 (3.7)	76 (9.6)	
	Once or twice per month	383 (15.7)	169 (21.4)	
	Once per week	279 (11.4)	110 (13.9)	
	2–4 times per week	449 (18.4)	93 (11.8)	
	5 times or more per week	932 (38.2)	104 (13.1)	
Alcohol consumption per occasion**: 1 gou (rice wine) =22.8 g				<0.001
	<45.6	1,238 (50.7)	382 (48.3)	
	45.6–68.4	572 (23.4)	57 (7.2)	
	≥68.4	207 (8.5)	23 (2.9)	
Sleep duration (hours:minutes per day)				0.161
	≥6:00	2,029 (83.1)	640 (80.9)	
	<6:00	413 (16.9)	151 (19.1)	
	Mean ± SD	6:31 ± 1:00	6:26 ± 1:02	0.097*
Type of business				<0.001
	Construction	1,193 (48.9)	97 (12.3)	
	Information and communication	117 (4.8)	46 (5.8)	
	Manufacturing	723 (29.6)	340 (43.0)	
	Combined services	278 (11.4)	159 (20.1)	
	Retail trade	121 (5.0)	26 (3.3)	
	Medical welfare	10 (0.4)	123 (15.5)	
Type of job				<0.001
	General workers	1,407 (57.6)	762 (96.3)	
	Field managers	624 (25.6)	16 (2.0)	
	Office managers	411 (16.8)	13 (1.6)	
Employment status				<0.001
	Full-time	2,206 (90.3)	441 (55.8)	
	Others (part-time, temporary, etc.)	236 (9.7)	350 (44.2)	
Years of continuous employment				<0.001
	<2 yr	258 (10.6)	129 (16.3)	
	2–9 yr	458 (18.8)	269 (34.0)	
	10–19 yr	898 (36.8)	241 (30.5)	
	20–29 yr	328 (13.4)	100 (12.6)	
	≥30 yr	500 (20.5)	52 (6.6)	
Working hour distribution				0.417
	Day-dominant	1,855 (76.0)	617 (78.0)	
	Day/night mixed-shift pattern	569 (23.3)	167 (21.1)	
	Night-dominant	18 (0.7)	7 (0.9)	
Days off work taken (days per month)				<0.001
	≥5	1,976 (80.9)	722 (91.3)	
	≤4	466 (19.1)	69 (8.7)	
Overtime work (hours per month)				<0.001
	<45	1,696 (69.5)	734 (92.8)	
	≥45	746 (30.5)	57 (7.2)	
Working schedule irregularity				0.003
	regular	2,101 (86.0)	712 (90.0)	
	irregular	341 (14.0)	79 (10.0)	
Shift work				<0.001
	No	2,096 (85.8)	628 (79.4)	
	Yes	346 (14.2)	163 (20.6)	

*t-test (others are χ^2-test).

**Most employees who replied to the question drink alcohol more than once a month.

Table 2. GHQ-12 score, attitude toward mental health resources, and suicidal ideation

	Male (n=2,442) n (%)	Female (n=791) n (%)	*p* value
GHQ-12 score			0.272
≤2	1,675 (68.6)	526 (66.5)	
≥3 (CMD*)	767 (31.4)	265 (33.5)	
Mean ± SD	2.23 ± 3.09	2.42 ± 3.20	0.146**
Demand for mental health resources			0.408
Not-in-need	1,651 (67.6)	522 (66.0)	
In-need	791 (32.4)	269 (34.0)	
Use of mental health resources			0.033
No	2,233 (91.4)	703 (88.9)	
Yes	209 (8.6)	88 (11.1)	
Suicidal ideation: part of Zung SDS "I feel that others would be better off if I were dead."			
A little of the time	2,097 (85.9)	668 (84.5)	0.730
Some of the time	263 (10.8)	91 (11.5)	
Good part of the time***	43 (1.8)	16 (2.0)	
Most of the time***	39 (1.6)	16 (2.0)	

*Common mental disorder, ***t*-test (others are χ^2-test), ***Suicidal ideation (+).

reflects the current situation in Japan, in which occupational roles assigned to men and women still differ[8, 29]. Given these sex differences in background factors, we analyzed findings for male and female respondents separately.

Since all types of psychiatric disorders including depression should be considered in promoting mental health measures in the workplace, we used the GHQ-12 instead of questionnaire forms for depressive symptoms. The GHQ-12 is a general-purpose instrument that enables reliable assessment across different cultures[24–26]. The majority of previous Japanese occupational studies using it involved a single type of business or civil servants. Urakawa *et al*. surveyed 466 workers from the manufacturing industry, and reported a mean GHQ-12 score of 1.91 ± 2.73[15]. The relatively high mean GHQ-12 score in the present study (2.28 ± 3.12) may be attributable to the high incidence of suicide in northern Japan[2] as well as performance of the survey during a prolonged period of poor economic conditions[9]. In many studies, the GHQ score has tended to be slightly higher in female than male respondents[14, 27]. In the present study, mean GHQ-12 scores were higher in females (2.43 ± 3.21) than males (2.25 ± 3.10), though not significantly so. A civil service officer survey by Ide *et al*. reported the mean GHQ-12 scores of 1.9–3.2 (male) and 2.5–4.0 (female)[17]. In addition, a close correlation was observed between GHQ-12 scores and presence/absence of suicidal ideation in both sexes.

Multivariate analysis revealed significant correlations of CMD with short sleep duration, working in manufacturing, combined services, or retail trade business, years of continuous employment, overtime work, working irregular schedules, need for mental health resources, and use of mental health resources in both male and female respondents. Many studies have examined the relationship between working hours and mental health burden[30]. Otsuka *et al*. conducted a survey among 1,821 workers from a single business establishment and found a significant correlation between working hours and fatigue and concentration/activity levels[31]. A cohort study by Virtanen[32] identified long working hours as an independent cause of sleep disturbance. The present study revealed a significant correlation between working overtime/irregular schedules and CMD, similar to Otsuka *et al*[31].

On the other hand, number of days taken off work and drinking behavior varied between male and female workers. In the present study, there were significant sex differences in drinking behavior and the number of days taken off work, and each factor was appeared to be associated with CMD. These findings may reflect the sex differences in lifestyle and social roles in Japan. Umezawa *et al*. reported that more female workers did housework than male workers on their holidays and before and after work[9]. Female workers were under more stress in their home and local community than male workers, according to Watanabe *et al*[14]. The burden of housework in addition to work may have been the reason for the lack of correlation between the number of days taken off work and CMD in female workers. According to the 2008 National Health and Nutrition Survey Japan, the proportion of individuals with a drinking habit was lower for females than for males, and the rate of appropriate drinking behavior was higher for females than for males[33]. Takada *et al*.

Table 3. Associations between CMD and sociodemographic characteristics, work-associated factors or attitude toward mental health resources in males, according to logistic regression analysis

		Crude			Adjusted*		
		OR	95%CI	*p* value	OR	95%CI	*p* value
Age (yr)							
	18–29	1					
	30–39	1.026	0.801–1.315	0.839			
	40–49	1.170	0.891–1.537	0.257			
	≥50	0.523	0.398–0.688	<0.001	0.824	0.590–1.153	0.259
Marital status							
	Married	1					
	Single	1.167	0.967–1.408	0.108			
	Divorced/bereaved	1.071	0.639–1.796	0.794			
Living condition							
	Living with own family	1					
	Living alone	0.963	0.749–1.239	0.772			
	Other	1.036	0.764–1.405	0.818			
Frequency of alcohol use							
	Never drink	1					
	Drank before, but now don't	1.191	0.735–1.931	0.478			
	Once or twice per month	0.912	0.664–1.254	0.572			
	Once per week	0.688	0.482–0.981	0.039	0.626	0.458–0.857	0.003
	2–4 times per week	0.937	0.690–1.273	0.677			
	5 times or more per week	0.818	0.622–1.076	0.151			
Alcohol consumption per occasion							
	<45.6	1					
	45.6–68.4	0.944	0.761–1.172	0.601			
	≥68.4	0.933	0.676–1.287	0.672			
Sleep duration (hours:minutes per day)							
	≥6:00	1					
	<6:00	2.451	1.975–3.041	<0.001	1.971	1.545–2.514	<0.001
Type of business							
	Construction	1					
	Information and communication	0.941	0.603–1.467	0.787			
	Manufacturing	1.879	1.540–2.292	<0.001	1.722	1.369–2.167	<0.001
	Combined services	1.900	1.444–2.499	<0.001	2.404	1.769–3.267	<0.001
	Retail trade	1.966	1.335–2.895	0.001	1.828	1.188–2.814	0.006
	Medical welfare	2.990	0.860–10.399	0.085			
Type of job							
	General workers	1					
	Field managers	1.024	0.837–1.253	0.819			
	Office managers	0.741	0.546–1.005	0.054			
Employment status							
	Full-time	1					
	Others (part-time, temporary, etc.)	0.734	0.541–0.996	0.047	0.826	0.584–1.168	0.278
Years of continuous employment							
	<2 yr	1					
	2–9 yr	1.035	0.746–1.435	0.837			
	10–19 yr	1.098	0.817–1.477	0.534			
	20–29 yr	1.520	1.080–2.140	0.016	1.284	0.976–1.689	0.074
	≥30 yr	0.510	0.362–0.719	<0.001	0.695	0.469–1.028	0.069
Working hour distribution							
	Day-dominant	1					
	Day/night mixed-shift pattern	1.116	0.913–1.363	0.285			
	Night-dominant	1.122	0.419–3.003	0.819			
Days off work taken (days per month)							
	≥5	1					
	≤4	1.688	1.370–2.080	<0.001	1.431	1.111–1.843	0.006
Overtime work (hours per month)							
	<45	1					
	≥45	2.325	1.940–2.786	<0.001	1.731	1.398–2.142	<0.001
Working schedule irregularity							
	regular	1					
	irregular	1.999	1.583–2.524	<0.001	1.612	1.234–2.107	<0.001
Shift work							
	No	1					
	Yes	1.119	0.879–1.425	0.360			
Demand for mental health resources							
	Unnecessary	1					
	Necessary	4.038	3.364–4.846	<0.001	3.793	3.120–4.162	<0.001
Use of mental health resources							
	No	1					
	Yes	1.854	1.391–2.472	<0.001	1.438	1.040–1.990	0.028

*Adjusted for other factors in multiple logistic regression analysis with stepwise elimination procedure at the $p<0.05$ significance level for entry into the model. OR, odds ratio; CI, confidence interval.

Table 4. Associations between CMD and sociodemographic characteristics, work-associated factors or attitude toward mental health resources in females, according to logistic regression analysis

		Crude			Adjusted*		
		OR	95%CI	*p* value	OR	95%CI	*p* value
Age (yr)							
	18–29	1					
	30–39	0.701	0.475–1.034	0.074			
	40–49	0.583	0.381–0.891	0.013	0.866	0.562–1.336	0.516
	≥50	0.396	0.245–0.640	<0.001	0.704	0.399–1.242	0.225
Marital status							
	Married	1					
	Single	1.697	1.227–2.348	0.001	1.398	0.944–2.069	0.094
	Divorced/bereaved	1.018	0.626–1.656	0.943			
Living condition							
	Living with own family	1					
	Living alone	1.340	0.851–2.109	0.206			
	Other	2.106	0.931–4.763	0.074			
Frequency of alcohol use							
	Never drink	1					
	Drank before, but now don't	1.392	0.801–2.420	0.241			
	Once or twice per month	1.362	0.888–2.089	0.156			
	Once per week	1.530	0.945–2.476	0.084			
	2–4 times per week	1.472	0.883–2.455	0.138			
	5 times or more per week	1.963	1.212–3.179	0.006	1.312	0.798–2.155	0.284
Alcohol consumption per occasion							
	<45.6	1					
	45.6–68.4	1.872	1.068–3.279	0.028	1.653	0.869–3.146	0.125
	≥68.4	2.520	1.076–5.903	0.033	2.092	0.805–5.441	0.130
Sleep duration (hours:minutes per day)							
	≥6:00	1					
	<6:00	1.721	1.197–2.473	0.003	1.748	1.152–2.652	0.009
Type of business							
	Construction	1					
	Information and communication	1.583	0.717–3.497	0.256			
	Manufacturing	1.731	1.015–2.952	0.044	1.849	1.093–3.127	0.022
	Combined services	2.193	1.228–3.917	0.008	2.157	1.197–3.889	0.011
	Retail trade	3.619	1.460–8.973	0.005	3.355	1.272–8.846	0.014
	Medical welfare	2.238	1.222–4.096	0.009	1.405	0.742–2.659	0.297
Type of job							
	General workers	1					
	Field managers	2.000	0.742–5.390	0.171			
	Office managers	0.600	0.164–2.199	0.441			
Employment status							
	Full-time	1					
	Others (part-time, temporary, etc.)	0.886	0.657–1.193	0.425			
Years of continuous employment							
	<2 yr	1					
	2–9 yr	0.835	0.543–1.285	0.412			
	10–19 yr	0.558	0.356–0.877	0.011	0.625	0.422–0.927	0.019
	20–29 yr	0.908	0.531–1.550	0.723			
	≥30 yr	0.444	0.213–0.926	0.030	0.650	0.274–1.544	0.329
Working hour distribution							
	Day-dominant	1					
	Day/night mixed-shift pattern	1.335	0.936–1.904	0.111			
	Night-dominant	5.370	1.033–27.921	0.046	2.623	0.312–22.072	0.375
Days off work taken (days per month)							
	≥5	1					
	≤4	1.141	0.682–1.909	0.615			
Overtime work (hours per month)							
	<45	1					
	≥45	2.186	1.271–3.758	0.005	1.774	0.937–3.359	0.078
Working schedule irregularity							
	regular	1					
	irregular	2.793	1.743–4.475	<0.001	2.218	1.259–3.908	0.006
Shift work							
	No	1					
	Yes	1.373	0.962–1.961	0.081			
Demand for mental health resources							
	Unnecessary	1					
	Necessary	5.830	4.216–8.061	<0.001	5.023	3.545–7.117	<0.001
Use of mental health resources							
	No	1					
	Yes	2.688	1.715–4.211	<0.001	1.929	1.114–3.341	0.019

*Adjusted for other factors in multiple logistic regression analysis with stepwise elimination procedure at the $p<0.05$ significance level for entry into the model. OR, odds ratio; CI, confidence interval.

Table 5. Associations between suicidal ideation and sociodemographic characteristics, work-associated factors, attitude toward mental health resources, or CMD in males, according to logistic regression analysis

		Crude			Adjusted*		
		OR	95%CI	*p* value	OR	95%CI	*p* value
Age (yr)							
	18–29	1					
	30–39	0.515	0.295–0.899	0.020	0.918	0.477–1.769	0.798
	40–49	0.449	0.230–0.876	0.019	0.805	0.363–1.787	0.594
	≥50	0.372	0.196–0.705	0.002	1.862	0.671–5.166	0.233
Marital status							
	Married	1					
	Single	3.319	2.107–5.229	<0.001	2.982	1.669–5.328	<0.001
	Divorced/bereaved	2.193	0.657–7.322	0.202			
Living condition							
	Living with own family	1					
	Living alone	0.787	0.388–1.598	0.508			
	Other	1.275	0.625–2.600	0.505			
Frequency of alcohol use							
	Never drink	1					
	Drank before, but now don't	1.136	0.401–3.214	0.811			
	Once or twice per month	1.076	0.541–2.139	0.834			
	Once per week	0.577	0.241–1.382	0.217			
	2–4 times per week	0.491	0.222–1.083	0.078			
	5 times or more per week	0.494	0.255–0.960	0.037			
Alcohol consumption per occasion							
	<45.6	1					
	45.6–68.4	1.154	0.636–2.097	0.637			
	≥68.4	2.115	1.049–4.266	0.036	1.785	0.862–3.697	0.119
Sleep duration (hours:minutes per day)							
	≥6:00	1					
	<6:00	1.728	1.040–2.871	0.035	0.916	0.521–1.612	0.762
Type of business							
	Construction	1					
	Information and communication	2.187	0.731–6.540	0.161			
	Manufacturing	3.715	2.139–6.452	<0.001	1.863	0.992–3.500	0.053
	Combined services	3.524	1.768–7.026	<0.001	3.107	1.462–6.601	0.003
	Retail trade	1.038	0.239–4.513	0.960			
	Medical welfare	6.865	0.828–56.919	0.074			
Type of job							
	General workers	1					
	Field managers	0.462	0.252–0.846	0.012	0.839	0.411–1.713	0.630
	Office managers	0.376	0.171–0.828	0.015	0.641	0.261–1.572	0.331
Employment status							
	Full-time	1					
	Others (part-time, temporary, etc.)	1.635	0.873–3.062	0.125			
Years of continuous employment							
	<2 yr	1					
	2–9 yr	0.861	0.421–1.760	0.681			
	10–19 yr	0.719	0.373–1.387	0.325			
	20–29 yr	0.411	0.162–1.046	0.062			
	≥30 yr	0.345	0.146–0.819	0.016	0.693	0.246–1.954	0.488
Working hour distribution							
	Day-dominant	1					
	Day/night mixed-shift pattern	1.930	1.219–3.056	0.005	1.306	0.647–2.635	0.457
	Night-dominant	N/A					
Days off work taken (days per month)							
	≥5	1					
	≤4	1.200	0.704–2.045	0.502			
Overtime work (hours per month)							
	<45	1					
	≥45	1.186	0.745–1.887	0.472			
Working schedule irregularity							
	regular	1					
	irregular	2.346	1.419–3.878	0.001	1.537	0.862–2.742	0.146
Shift work							
	No	1					
	Yes	2.458	1.497–4.037	<0.001	1.182	0.529–2.642	0.683
Demand for mental health resources							
	Unnecessary	1					
	Necessary	4.495	2.813–7.182	<0.001	2.516	1.499–4.222	<0.001
Use of mental health services							
	No	1					
	Yes	2.500	1.401–4.459	0.002	1.847	0.951–3.587	0.070
GHQ-12 score							
	≤2	1					
	≥3 (CMD)	9.031	5.256–15.514	<0.001	6.091	3.398–10.919	<0.001

*Adjusted for other factors in multiple logistic regression analysis with stepwise elimination procedure at the $p<0.05$ significance level for entry into the model. OR, odds ratio; CI, confidence interval; N/A, not applicable.

Table 6. Associations between suicidal ideation and sociodemographic characteristics, work-associated factors, attitude toward mental health resources, or CMD in females, according to logistic regression analysis

		Crude			Adjusted*		
		OR	95%CI	*p* value	OR	95%CI	*p* value
Age (yr)							
	18–29	1					
	30–39	0.394	0.175–0.889	0.025	0.587	0.205–1.680	0.320
	40–49	0.158	0.045–0.553	0.004	0.463	0.106–2.012	0.304
	≥50	0.205	0.059–0.719	0.013	0.914	0.208–4.016	0.905
Marital status							
	Married	1					
	Single	3.749	1.715–8.198	0.001	2.037	0.847–4.897	0.112
	Divorced/bereaved	1.480	0.399–5.485	0.557			
Living condition							
	Living with own family	1					
	Living alone	0.830	0.247–2.794	0.764			
	Other	2.189	0.486–9.787	0.305			
Frequency of alcohol use							
	Never drink	1					
	Drank before, but now don't	1.604	0.469–5.483	0.451			
	Once or twice per month	1.435	0.528–3.092	0.479			
	Once per week	1.090	0.321–3.698	0.891			
	2–4 times per week	0.963	0.250–3.709	0.956			
	5 times or more per week	1.458	0.466–4.568	0.517			
Alcohol consumption per occasion							
	<45.6	1					
	45.6–68.4	4.317	1.624–11.476	0.003	2.230	0.801–6.210	0.125
	≥68.4	1.402	0.174–11.273	0.751			
Sleep duration (hours:minutes per day)							
	≥6:00	1					
	<6:00	1.436	0.632–3.262	0.388			
Type of business							
	Construction	1					
	Information and communication	2.159	0.294–15.831	0.449			
	Manufacturing	2.192	0.493–9.757	0.303			
	Combined services	2.850	0.603–13.476	0.186			
	Retail trade	3.958	0.530–29.556	0.180			
	Medical welfare	0.785	0.109–5.677	0.811			
Type of job							
	General workers	1					
	Field managers	1.450	0.714–2.946	0.304			
	Office managers	0.703	0.307–1.610	0.404			
Employment status							
	Full-time	1					
	Others (part-time, temporary, etc.)	1.450	0.714–2.946	0.304			
Years of continuous employment							
	<2 yr	1					
	2–9 yr	0.703	0.307–1.610	0.404			
	10–19 yr	0.304	0.108–0.856	0.024	0.775	0.257–2.336	0.651
	20–29 yr	0.120	0.015–0.955	0.045	0.386	0.044–3.420	0.393
	≥30 yr	N/A					
Working hour distribution							
	Day-dominant	1					
	Day/night mixed-shift pattern	0.536	0.185–1.554	0.251			
	Night-dominant	3.642	0.423–31.324	0.239			
Days off work taken (days per month)							
	≥5	1					
	≤4	1.525	0.519–4.483	0.443			
Overtime work (hours per month)							
	<45	1					
	≥45	1.351	0.399–4.577	0.629			
Working schedule irregularity							
	regular	1					
	irregular	1.303	0.445–3.815	0.629			
Shift work							
	No	1					
	Yes	0.387	0.116–1.288	0.122			
Demand for mental health resources							
	Unnecessary	1					
	Necessary	9.202	3.739–22.648	<0.001	3.658	1.361–9.828	0.010
Use of mental health services							
	No	1					
	Yes	6.240	2.963–13.140	<0.001	3.141	1.342–7.350	0.008
GHQ-12 score							
	≤2	1					
	≥3 (CMD)	15.418	5.348–44.449	<0.001	6.980	2.241–21.744	0.001

*Adjusted for other factors in multiple logistic regression analysis with stepwise elimination procedure at the $p<0.05$ significance level for entry into the model. OR, odds ratio; CI, confidence interval; N/A, not applicable.

reported that problem drinking was closely associated with both depressive symptoms and suicidal ideation[20]. More frequent drinking by males might be related to CMD prevalence, although the present study included no question item on problem drinking. In addition, the correlation between alcohol use and sleep disturbance should be examined in more detail, since difficulty falling asleep may be a cause of habitual alcohol use. These findings suggest that occupational mental health promotion measures should consider the job/business type-specific working environment and factors related to overwork, and that further investigations must be performed regarding drinking behavior and number of days taken off work.

Compared with large-sized business establishments, adequate mental health care activities are not implemented well in medium-sized business establishments in Japan[12, 34, 35]. While more than 95% of large-sized business establishments in Japan have mental health care resources, only 45.2–83.0% of medium-sized business establishments do[10]. Ensuring the availability of cost-effective mental health services is thus needed in medium-sized business establishments. Mental health resources include not only human resources such as psychiatrists, clinical psychologists, and psychiatric social workers but also a preventive care system adjusted to the size and needs of business establishments. Screening of high-risk populations is a priority in the drafting of mental health measures.

In the present study, 3.4% of males and 4.0% of females indicated having suicidal ideation. However, caution is needed when comparing results of studies on suicidal ideation and behavior, due to differences in the definitions and frequencies of suicidal ideation among studies[4, 20, 22, 36]. In a WHO World Mental Health Survey using face-to-face interviews, 12-month prevalence estimates of suicidal ideation were 1.7% for males and 2.2% for females in ten developed countries including Japan[4]. In a study on depressive symptoms and suicide intention among 5,174 workers conducted by Yamada *et al*., 10.3% of males and 13.0% of females had suicide intention[22]. The Zung SDS is widely used for screening of symptoms of depression[8, 22]. In the present study, one questionnaire item was adopted from the scale for screening for suicidal rumination[27], which was described by Zung and reflects frequency and/or repetition of suicidal ideation. Ayalon *et al*. divided suicidal ideation into active and passive type[36] and pointed out that the notion of "better off dead", which is similar to the phrase used in the present study, represents passive suicidal ideation. An anonymous, self-administered questionnaire form was considered inappropriate for screening for active suicidal ideation. Addition or enhancement of sociopsychological stress factors may increase the risk for suicide in the population with suicidal ideation.

Galdas *et al*. demonstrated that men are more likely to inhibit help-seeking behavior than women[7], consistent with the findings of the present study. Both the percentage of individuals in the CMD group and the percentage of individuals with suicidal ideation were slightly higher in females than in males. Moreover, "experience of use" with mental health resources was less common for male than female respondents while no sex difference was found in the "demand" for mental health resources.

Multivariate analysis revealed a significant correlation between suicidal ideation and "demand" for mental health resources in both male and female respondents. Among male respondents, the prevalence of suicidal ideation was significantly higher in those who were single and working in manufacturing or combined services businesses. In female respondents, the prevalence of suicidal ideation was significantly higher in those who had used mental health resources than in those who had not. These findings suggest that providing more support for single male workers and assisting female employees in receiving consultation services are effective in preventing suicide and that measures to prevent isolation are important for both male and female workers. We were unable to determine the reason for the high prevalence of suicidal ideation in male workers from manufacturing and combined services businesses. Identification of job/business type-specific stressors may be necessary for designing suicide prevention measures in the workplace.

The limitations of the present study include the following: First, use of an anonymous, self-administered questionnaire form and exclusion of incomplete responses might have caused some selection bias. Second, the definitions of CMD and suicidal ideation may have differed from those used in other studies. Finally, this was a cross-sectional study and needs to be developed into a prospective or longitudinal study.

In conclusion, the present study examined general mental health, suicidal ideation and related factors focusing on sex differences in about 3,000 workers from 17 medium-sized business establishments in northern Japan. Rates of both CMD and suicidal ideation were higher in female workers, though not significantly so, and the prevalence of suicidal ideation was significantly higher in those with CMD than in those without CMD in both sexes. Significant correlations between CMD and the following factors were found for both sexes: short sleep; irregular working schedule; working in manufacturing; combined services, or retail trade; demand

for mental health resources; and use of such resources. Associations between CMD and excess workload (taking days off and overtime work) were significant only in male workers.

Regarding the association between suicidal ideation and help-seeking behavior, significant correlations were observed between suicidal ideation and use of mental health resources for female workers alone, while correlations between suicidal ideation and demand for mental health resources were observed in both sexes.

These findings suggest that improvement of the availability of mental health resources is needed, with adjustment for sex differences, particularly in help-seeking behavior and business/job type-specific stressors in employees of medium-sized business establishments.

Acknowledgements

This study was supported by a research investigation grant (2007) from the Japan Labor Health and Welfare Organization. We would like to express our deepest gratitude to the staff of the business establishments participating in the study and the staff of the Iwate Industrial Health Promotion Center for their cooperation and to Prof. Akio Sakai of the Department of Neuropsychiatry, Iwate Medical University, for his kind advice during the preparation of this paper.

References

1) World Health Organization (2010) Suicide prevention (SUPRE). http://www.who.int/mental_health/prevention/suicide/supresuicideprevent/en/. Accessed May 7, 2010.
2) Japan Cabinet Office, Government of Japan (2009) Whitepaper on Suicide. http://www8.cao.go.jp/jisatsu_taisaku/whitepaper/w-2009/pdf/pdf_honpen/h026.pdf. Accessed May 7, 2010 (in Japanese).
3) Takaya Y, Chida F, Otsuka K, Sakata K, Aoki Y (2006) Study on the regional accumulation of suicide and the background factors in Iwate Prefecture. J Iwate Med Assoc **58**, 205–16 (in Japanese with English abstract).
4) Borges G, Nock MK, Haro Abad JM, Hwang I, Sampson NA, Alonso J, Andrade LH, Angermeyer MC, Beautrais A, Bromet E, Bruffaerts R, de Girolamo G, Florescu S, Gureje O, Hu C, Karam EG, Kovess-Masfety V, Lee S, Levinson D, Medina-Mora ME, Ormel J, Posada-Villa J, Sagar R, Tomov T, Uda H, Williams DR, Kessler RC (2010) Twelve-month prevalence of and risk factors for suicide attempts in the world health organization world mental health surveys. J Clin Psychiatry **71**, 1617–28.
5) Bogdanovica I, Jiang GX, Lohr C, Schmidtke A, Mittendorfer-Rutz E (2010) Changes in rates, methods and characteristics of suicide attempters over a 15-year period: comparison between Stockholm, Sweden, and Wurzburg, Germany. Soc Psychiat Epidemiol (Epub ahead of print).
6) Yambe T, Otsuka K, Hoshi K, Isono H, Endo J, Nakamura H, Endo S (2008) Comparison of suicidal persons by gender and age group. J Iwate Med Assoc **60**, 89–103 (in Japanese with English abstract).
7) Galdes P, Cheater F, Marshall P (2005) Men and health help-seeking behavior: literature review. J Adv Nurs **49**, 616–23.
8) Umezawa Y, Umezawa A (2007) Assessing the link between mental health and work—life balance for employees of Japanese manufacturers. Jpn Bull Soc Psychiat **16**, 97–111 (in Japanese with English abstract).
9) Japan Ministry of Health, Labour, and Welfare (2009) Whitepaper on Health, Labour, and Welfare. http://www.mhlw.go.jp/wp/hakusyo/kousei/09/index.html. Accessed May 7, 2010 (in Japanese).
10) Japan Ministry of Health, Labour, and Welfare (2007) http://www.mhlw.go.jp/toukei/itiran/roudou/saigai/anzen/kenkou07/index.html. Accessed May 7, 2010 (in Japanese).
11) Japan Ministry of Health, Labour, and Welfare (2006) http://www.mhlw.go.jp/bunya/roudoukijun/anzeneisei12/index.html. Accessed December 19, 2010 (in Japanese).
12) Inoue A, Kawakami N, Hiro H, Miyamoto T, Tsutsumi A (2008) Current status of worksite mental health care and doctors' interviews of workers with long working hours based on the new occupational mental health guidelines and the revised industrial safety and health law in Japan: a comparison by worksite size. Job Stress Res **15**, 151–61 (in Japanese with English abstract).
13) Japan Ministry of Internal Affairs and Communications (2006) 2006 Establishment and Enterprise Census of Japan. http://www.stat.go.jp/data/jigyou/2006/index.htm. Accessed October 14, 2010 (in Japanese).
14) Watanabe H, Suzuki M, Ito K, Tabei A (2002) A mental health questionnaire survey to Japanese workers. Occup Ment Health **10**, 71–82 (in Japanese with English abstract).
15) Urakawa K, Yokoyama K (2009) Sense of coherence may reduce the effects of occupational stress on mental health status among Japanese factory workers. Ind Health **47**, 503–8.
16) Ikeda T, Nakata A, Takahashi M, Hojou M, Haratani T, Nishikido N, Kamibeppu K (2009) Correlates of depressive symptoms among workers in small- and medium-scale manufacturing enterprises in Japan. J Occup Health **51**, 26–37.
17) Ide R, Hoshuyama T, Wilson D, Takahashi K, Higashi T (2006) Association of psychological well-being with oral conditions in Japanese workers. J Occup Health **48**, 487–93.
18) Ye Z, Honda S, Abe Y, Kusano Y, Takamura N,

Imamura Y, Eida K, Takemoto T, Aoyagi K (2007) Influence of work duration or physical symptoms on mental health among Japanese visual display terminal users. Ind Health **45**, 328–33.
19) Kageyama T, Kawashima M, Oga J (2005) Marital status, coping profile, and sympathy to suicide among personnel of a local government. Jpn J Ment Health **20**, 97–101 (in Japanese).
20) Takada M, Suzuki A, Shima S, Inoue K, Kazukawa S, Hojoh M (2009) Associations between lifestyle factors, working environment, depressive symptoms and suicidal ideation. Ind Health **47**, 649–55.
21) Amagasa T, Nakayama T, Takahashi Y (2005) Karojisatsu in Japan: Characteristics of 22 cases of work-related suicide. J Occup Health **47**, 157–64.
22) Yamada K, Hirano K (2003) Mental health and suicide intention of workers in small and medium-sized enterprises. J Natl Inst Public Health **52**, 302–8 (in Japanese).
23) Vgontzas A, Liao D, Bixler E, Chrousos G, Vela-Bueno A (2009) Insomnia with objective short sleep duration is associated with a high risk for hypertension. Sleep **32**, 491–7.
24) Nakagawa Y, Daibo I (1985) Japanese version of the General Health Questionnaire, Nihon Bunka Kagakusha, Tokyo (in Japanese).
25) Yoshitake K (2000) The study of GHQ-12 from the results of WHO collaborative study "Psychological Problems in General Health Care". Arch Psychiatr Diagn Clin Evaluation **11**, 309–21 (in Japanese with English abstract).
26) Goldberg DP, Oldehinkel T, Ormel J (1998) Why GHQ threshold varies from one place to another. Psychol Med **28**, 915–21.
27) Laaksonen E, Martikanen P, Lallukka T, Lahelma E, Ferrie J, Rahkonen O, Marmot M, Head J (2009) Economic difficulties and common mental disorders among Finnish and British white-collar employees. J Epidemiol Community Health **63**, 439–46.
28) Zung WWK (1965) A self-rating depression scale. Arch Gen Psychiatry **12**, 63–70.
29) Okano T (2004) Women's health and mental health. J Ther **86**, 77–83 (in Japanese).
30) Fujino Y, Horie M, Hoshuyama T, Tsutsui T, Tanaka Y (2006) A systematic review of working hours and mental health burden. San Ei Shi **48**, 87–97 (in Japanese with English abstract).
31) Otsuka Y, Sasaki T, Iwasaki K, Mori I (2009) Working hours, coping skills, and psychological health in Japanese daytime workers. Ind Health **47**, 22–32.
32) Virtanen M, Ferrie JE, Gimeno D, Vahtera J, Elovainio M, Singh-Manoux A, Marmot MG, Kivimäki M (2009) Long working hours and sleep disturbances: the Whitehall II prospective cohort study. Sleep **32**, 37–45.
33) Japan Ministry of Health, Labour, and Welfare (2009) 2008 National Health and Nutrition Survey Japan. http://www.mhlw.go.jp/houdou/2009/11/h1109-1.html. Accessed January **4**, 2011 (in Japanese).
34) Takeuchi K, Shiihara Y, Suzuki S, Kashiwagi Y, Fujii H, Natsume M, Seo S, Yamamoto K, Fukuchi T (2004) Research on the status quo of professional resources for occupational mental health management outside the workplace. Jpn J Occup Med Trauma **52**, 276–83 (in Japanese with English abstract).
35) Kawakami N, Tsutsumi A, Kobayashi Y, Hirokawa K, Shimazu A, Nagami M, Iwata N, Haratani T (2004) Development of a checklist for evaluation of mental health activities at the workplace. San Ei Shi **47**, 11–32 (in Japanese with English abstract).
36) Ayaron L, Macken S, Arean A, Chen H, McDonel E (2007) The role of cognitive functioning and distress in suicidal ideation in older adults. J Am Geriatr Soc **55**, 1090–4.