

Changes in drinking habits and psychological distress in Japanese non- or occasional drinking workers: a one-year prospective cohort study

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Abstract: This study investigated whether non- or occasional drinkers' changes in drinking habits during a one-year period were related to psychological distress. Overall, 2,495 non- or occasional drinking employees (2,109 men and 386 women) completed a self-administered questionnaire measuring alcohol intake, psychological distress (12-item General Health Questionnaire), and demographic characteristics at baseline and one-year follow-up. They also completed a Web-based version of the Brief Job Stress Questionnaire to assess job stressors at baseline. Participants were categorized into three groups (stable non- or occasional drinkers; new light drinkers; new moderate drinkers) according to weekly alcohol consumption at follow-up (males 0 g/wk, 1–79 g/wk, and ≥ 80 g/wk; females 0 g/wk, 1–39 g/wk, and ≥ 40 g/wk, respectively); multiple logistic regression analyses were conducted by sex. Among only male participants, both stable non- or occasional drinkers and new moderate drinkers showed significantly higher odds ratios for psychological distress at follow-up than new light drinkers after adjusting for demographic characteristics, job stressors, and psychological distress at baseline (adjusted odds ratios of 1.72 and 1.99, respectively). These findings suggest that men who started to drink 80 g or more alcohol per week during the one-year follow-up period should have been monitored for psychological distress.

Key words: Drinking habits, Japan, Prospective studies, Psychological distress, Workplace

Introduction

Previous studies have reported that poor mental health may lead to absenteeism, poor job performance, and increased risk of workplace injury among workers^{1–3}. It is therefore necessary to prevent poor mental health in the workplace. Poor mental health is associated with alco-

hol intake⁴, and some studies have used methods such as brief interventions^{5–7} to induce heavy drinking workers to change their drinking patterns.

Several studies have identified a J-shaped relationship between alcohol consumption and poor mental health^{8–12}. This J-shaped curve indicates that non-drinkers and heavy drinkers have a high risk of depression and psychological distress. It is unclear why non-drinkers have a higher risk of poor mental health than moderate drinkers; however, there are several possible explanations. One study found that non-drinkers have lower-status jobs and lower educa-

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tion and receive less social support than drinkers who consume alcohol up to 140 g/wk (for men) or 70 g/wk (for women)⁸). Differences in social factors may confound the association of alcohol intake with poor mental health.

Another explanation for non-drinkers being at high risk of poor mental health is that they may have quit drinking because of illness or drinking problems; this is reflected in the “sick-quitter” hypothesis¹³). However, studies on the association between alcohol consumption and mental health that have taken sick-quitter effects into account have produced mixed results. One investigation found that non-drinkers with previous hazardous drinking were at higher risk of psychological distress than non-drinkers without previous drinking problems⁹). Conversely, some studies have reported the risk of depression in non-drinkers to be higher than that in light drinkers after excluding previous heavy drinkers from the non-drinker category¹⁰) and after excluding prevalent and lifetime cases of psychiatric disorders and physical disease¹²).

There are various reasons why non-drinkers do not drink alcohol regularly, and some non-drinkers do start drinking. However, it is unclear whether individuals who start drinking regularly have a high risk of psychological distress. If an association between changes in drinking habits and psychological distress could be demonstrated, occupational health staffs could select candidates for support activities by focusing not only on alcohol consumption but also on changes in drinking habits. This type of selection would be particularly useful for workers who have recently started drinking regularly, because their alcohol consumption shortly after drinking onset may not always reach the required level for intervention.

Furthermore, most studies that have examined the association between alcohol consumption and psychological distress^{8–12}) have been conducted on the general population. However, studies on general workers may help to clarify this association: some social factors, such as occupational status and social support^{8,9}), which are confounding variables, can be statistically adjusted more easily for general workers than for the general population. In addition, annual health checkups in Japanese workplaces are allowed to monitor workers’ alcohol consumption and changes in drinking habits.

The aim of the present study was to investigate the association between changes in drinking habits during a one-year follow-up period and psychological distress among Japanese non- or occasional drinking workers at baseline. We explored this association by adjusting for job stressors, such as job demands, job control, supervisor support, and

coworker support, because these stressors have significant effects on the psychological distress of workers¹⁴).

Subjects and Methods

Participants

We conducted a prospective study of employees of a Japanese company from April 2009 to June 2010. At baseline (April to September 2009; Time 1, T1), all employees ($n=10,177$) were invited to participate in this study. Of these, 10,129 employees (9,437 males, 692 females) completed both the self-administered questionnaire and the Web-based questionnaire. The self-administered questionnaire assessed alcohol intake (quantity and frequency), psychological distress, and demographic and occupational characteristics. The Web-based questionnaire assessed job stressors. Because this study focused only on non- or occasional drinkers at T1, regular drinkers at T1 ($n=7,243$) were excluded. Thus, 2,886 (2,441 males, 445 females) eligible employees were included in the follow-up. From April to June 2010 (Time 2, T2), alcohol intake, psychological distress, and demographic and occupational characteristics were assessed using the same questionnaire. After excluding employees who could not respond because of retirement or administrative leave at T2, or who had at least one missing response on the questionnaires at T1 or T2, the data from 2,495 employees (2,109 males, 386 females) were analyzed. The mean follow-up period was 364.2 d (range, 232–489 d). The Ethics Committee of the University of Occupational and Environmental Health, Japan, reviewed and approved this study (No. H23-108).

Measures

1) Alcohol intake

To examine drinking habits, participants were first asked whether they drank alcohol regularly (defined as one or more times per week). If participants responded that they did consume alcohol regularly, they were further questioned about the weekly frequency of their drinking, the type of drinks they consumed, and average weekly consumption. To estimate alcohol consumption, the amount of ethanol in each type of alcoholic beverage was calculated as follows: 180 ml sake (23 g ethanol), 180 ml *shochu* (36 g ethanol), 633 ml beer (23 g ethanol), 30 ml whiskey or brandy (10 g ethanol), and 60 ml wine (6 g ethanol). The weekly ethanol intake was summed to obtain the total amount of ethanol for all alcoholic beverages.

2) Psychological distress

We assessed psychological distress using the Japanese version of the 12-item General Health Questionnaire (GHQ-12)^{15, 16}. The GHQ-12 consists of 12 items measured on a four-point scale. Scoring was conducted using the Goldberg method (all items coded 0-0-1-1); the total score ranged from 0 to 12 points. Higher scores for the GHQ-12 indicate greater psychological distress. The validity and reliability of the Japanese version of the GHQ-12 have been confirmed¹⁶. In our sample, Cronbach's alpha coefficients were 0.89 and 0.90 for T1 and T2, respectively.

3) Other covariates

Other covariates included demographic characteristics (i.e., sex, age, marital status, household type, and smoking status), occupational characteristics (i.e., occupation and job grade), and job stressors (i.e., job demands, job control, supervisor support, and coworker support). We assessed demographic and occupational characteristics using the self-administered questionnaire. We categorized age into four groups: ≤ 29 yr; 30–39 yr; 40–49 yr; and ≥ 50 yr. Marital status was dichotomized into single and married. Household type was classified into two groups: living alone and living with family. Smoking status was classified into three groups: never smoker; former smoker; and current smoker. Occupation was dichotomized into clerks and technicians; job grade was dichotomized into managers and non-managers.

We measured job demands, job control, supervisor support, and coworker support using a subscale of the Brief Job Stress Questionnaire (BJSQ)¹⁷. The job demands scale comprises three items; for example, "I have an extremely large amount of work to do." The job control scale consists of three items; for example, "I can work at my own pace." The supervisor support and coworker support scale comprises three items; for example, "How reliable are the following people when you are in trouble?" Each item is measured on a four-point Likert-type response option, ranging from 1 (very much) to 4 (not at all) for the job demands and job control scales and from 1 (extremely) to 4 (not at all) for the supervisor support and coworker support scales. Each BJSQ subscale score was calculated by summing the reversed item scores. For this sample, Cronbach's alpha coefficients were 0.78 for job demands, 0.71 for job control, 0.84 for supervisor support, and 0.83 for coworker support.

Statistical analysis

Because of sex differences in the prevalence of major

depression and the effects of alcohol, all analyses were stratified by sex. Taking into account changing drinking habits, we defined regular drinkers at T2 whose drinking frequencies or quantities were relatively large as new moderate drinkers. We defined regular drinkers at T2 who showed appropriate drinking frequencies and quantities as new light drinkers; there were no concerns about the alcohol intake of these individuals. The cutoff point was determined according to the appropriate level of weekly alcohol consumption. The appropriate alcohol consumption level recommended by the National Health Promotion Movement in the 21st Century¹⁸ is approximately 20 g/d for men. As previously reported¹⁹, heavy consumption of alcohol 5–7 d/wk is associated with an increased risk of all-cause mortality. Therefore, it is important that regular drinkers only drink alcohol 1–4 d/wk and abstain from alcohol for 2 or more d/wk. Thus, the cutoff point between new light drinkers and new moderate drinkers was 80 g/wk for men. A lower level of alcohol intake is recommended for women¹⁸, but there are no clear recommendations for appropriate alcohol consumption. However, the National Health Promotion Movement in the 21st Century¹⁸ has shown that the female cutoff point for alcohol consumption at which the risk of lifestyle diseases increases is half the male cutoff point (≥ 40 g/d for males and ≥ 20 g/d for females). Thus, regular drinkers at T2 were dichotomized based on whether or not their alcohol consumption was ≥ 80 g/wk for males and ≥ 40 g/wk for females. Participants were categorized into three groups based on alcohol consumption: stable non- or occasional drinkers, new light drinkers, and new moderate drinkers (males, 0 g/wk, 1–79 g/wk, and ≥ 80 g/wk; females, 0 g/wk, 1–39 g/wk, and ≥ 40 g/wk, respectively). In accordance with previous studies, participants with a score of ≥ 4 on the GHQ-12^{20, 21} were defined as experiencing psychological distress.

We used a chi-square test to compare the distribution of each categorical variable across the three groups according to alcohol consumption at T2. We used a Kruskal–Wallis test to compare the three group means for each continuous variable. The Mann–Whitney U test was used to compare the frequency and quantity of alcohol consumption between the new light and moderate drinker groups. Multiple logistic regression models were used to estimate the odds ratios for psychological distress associated with change in drinking habits at T2. We sequentially introduced variables into the model. First, we entered demographic characteristics at T2 (Model 1). Second, we entered occupational characteristics at T2 (Model 2). Third, we added job stressors at T1 (Model 3). Finally, we introduced psychological dis-

Table 1. Demographic characteristics at one-year follow-up among non- or occasional drinkers at baseline

	Male (n=2,109)						Female (n=386)							
	Stable non- or occasional drinker (n=1,728)		New light drinker (1–79 g) (n=236)		New moderate drinker (≥80 g) (n=145)		<i>p</i> †	Stable non- or occasional drinker (n=344)		New light drinker (1–39 g) (n=25)		New moderate drinker (≥40 g) (n=17)		<i>p</i> †
	Mean (SD)	<i>n</i> (%)	Mean (SD)	<i>n</i> (%)	Mean (SD)	<i>n</i> (%)		Mean (SD)	<i>n</i> (%)	Mean (SD)	<i>n</i> (%)	Mean (SD)	<i>n</i> (%)	
Age (yr)	39.4 (9.6)		36.6 (9.4)		37.0 (10.8)		<0.001	38.9 (9.8)		35.6 (11.3)		35.1 (11.9)		0.144
≤29		259 (15.0)		62 (26.3)		39 (26.9)	<0.001		75 (21.8)		9 (36.0)		6 (35.3)	0.259
30–39		594 (34.4)		84 (35.6)		45 (31.0)			75 (21.8)		7 (28.0)		4 (23.5)	
40–49		602 (34.8)		70 (29.7)		41 (28.3)			151 (43.9)		5 (20.0)		6 (35.3)	
≥50		273 (15.8)		20 (8.5)		20 (13.8)			43 (12.5)		4 (16.0)		1 (5.9)	
Marital status														
Single		526 (30.4)		76 (32.2)		54 (37.2)	0.219		167 (48.5)		14 (56.0)		11 (64.7)	0.348
Married		1,202 (69.6)		160 (67.8)		91 (62.8)			177 (51.5)		11 (44.0)		6 (35.3)	
Household type														
Living alone		620 (35.9)		88 (37.3)		61 (42.1)	0.318		113 (32.8)		12 (48.0)		12 (70.6)	0.003
Living with family		1,108 (64.1)		148 (62.7)		84 (57.9)			231 (67.2)		13 (52.0)		5 (29.4)	
Smoking status														
Never smoker		1,042 (60.3)		145 (61.4)		65 (44.8)	0.002		330 (95.9)		24 (96.0)		16 (94.1)	0.972
Former smoker		168 (9.7)		19 (8.1)		14 (9.7)			2 (0.6)		0 (0.0)		0 (0.0)	
Current smoker		518 (30.0)		72 (30.5)		66 (45.5)			12 (3.5)		1 (4.0)		1 (5.9)	
Occupation														
Clerk		517 (29.9)		74 (31.4)		59 (40.7)	0.026		321 (93.3)		24 (96.0)		16 (94.1)	0.866
Technician		1,211 (70.1)		162 (68.6)		86 (59.3)			23 (6.7)		1 (4.0)		1 (5.9)	
Job grade														
Manager		360 (20.8)		45 (19.1)		40 (27.6)	0.115		12 (3.5)		2 (8.0)		3 (17.6)	0.014
Non-manager		1,368 (79.2)		191 (80.9)		105 (72.4)			332 (96.5)		23 (92.0)		14 (82.4)	

† To determine statistical significance across the three groups, a chi-square test was used to analyze categorical variables and the Kruskal-Wallis test for continuous variables.

Table 2. Alcohol intake at one-year follow-up among non- or occasional drinkers at baseline

	Male (n=2,109)						Female (n=386)							
	Stable non- or occasional drinker (n=1,728)		New light drinker (1–79 g) (n=236)		New moderate drinker (≥80 g) (n=145)		<i>p</i> ‡	Stable non- or occasional drinker (n=344)		New light drinker (1–39 g) (n=25)		New moderate drinker (≥40 g) (n=17)		<i>p</i> ‡
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	Mean (SD)				
Weekly alcohol consumption (g)	0.0	46.5 (19.6)	158.6 (84.4)	<0.001	0.0	24.0 (5.4)	70.6 (25.5)	<0.001						
Weekly frequency of alcohol intake	0.0	1.9 (1.4)	2.6 (1.7)	<0.001	0.0	1.5 (1.0)	2.1 (0.9)	0.015						

‡ To determine statistical significance between the new light and moderate drinker groups, the Mann-Whitney U test was used.

stress at T1 (Model 4). We adjusted for demographic characteristics at T2 in each model because we predicted that demographic characteristics at T2, rather than at T1, would influence psychological distress at T2. In addition, we used the new light drinker group as a reference because we predicted that this group would have the lowest risk of psychological distress among the three groups^{8–12}. The level of significance was 0.05 (two-tailed). Statistical analyses were conducted using SPSS Statistics for Windows, Version 17 (SPSS Inc., Chicago, IL, USA).

Results

Demographic characteristics, alcohol consumption, and job stressors

We classified the demographic characteristics of participants by group according to alcohol consumption at T2, as shown in Table 1. Among male participants, the new moderate drinkers contained a higher proportion of current smokers and clerks than did the stable non- or occasional drinkers and new light drinkers. For female participants, the new moderate drinkers contained a higher proportion of individuals living alone and individuals in managerial

Table 4. Psychological distress associated with change in drinking habits at one-year follow-up by sex^a

	Model 1 ^b		Model 2 ^c		Model 3 ^d		Model 4 ^e	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Male								
New light drinker (1–79 g) as reference								
Stable non- or occasional drinker	1.63	1.12–2.36	1.63	1.12–2.36	1.57	1.06–2.31	1.72	1.12–2.63
New moderate drinker (≥ 80 g)	1.65	0.98–2.78	1.61	0.96–2.73	1.83	1.05–3.16	1.99	1.09–3.63
Female								
New light drinker (1–39 g) as reference								
Stable non- or occasional drinker	1.14	0.47–2.74	1.14	0.47–2.75	1.39	0.52–3.74	1.13	0.41–3.11
New moderate drinker (≥ 40 g)	0.43	0.10–1.77	0.43	0.10–1.78	0.66	0.15–2.95	0.47	0.10–2.20

^a Psychological distress was defined as a score of 4 or more on the GHQ-12 scale.

^b Adjusted for age, marital status, household type, and smoking status at one-year follow-up.

^c Additionally adjusted for occupation and job grade at one-year follow-up.

^d Additionally adjusted for job demands, job control, supervisor support, and coworker support at baseline.

^e Additionally adjusted for psychological distress at baseline.

new light drinkers. These odds ratios were even higher after adjusting for demographic characteristics, job stressors, and psychological distress at T1. This result is partially consistent with earlier reports in Western countries, which have described the J-curve association between alcohol consumption and poor mental health^{8–12}. However, in the present study, the threshold at which alcohol consumption was associated with psychological distress was much lower than previously reported levels^{8–12}. This threshold difference may be because the current study focused on alcohol consumption within one year of drinking onset. Among people who begin drinking in adulthood, those who initially consume a low amount of alcohol are more likely to quit drinking. Conversely, for those who initially consume a hazardous amount, subsequent alcohol consumption is likely to increase further²². In the present study, new moderate drinkers (who consumed 80 g or more of alcohol per week during the one-year follow-up period) may have included individuals at higher risk of becoming heavy drinkers. This might explain why we found a significant association between drinking and psychological distress at levels of alcohol consumption lower than those reported in previous studies. Moreover, if individuals who have been advised to abstain because of previous drinking problems or alcohol-related disorders resume drinking, their alcohol consumption quickly increases and becomes difficult to control²³. Thus, compared with the new light drinkers, the new moderate drinkers in the present study may have included a higher proportion of individuals who previously abstained but recommenced drinking during the follow-up period.

Stable male non- or occasional drinkers showed significantly higher odds ratios for psychological distress

than new male light drinkers. This is also consistent with previous findings from Western-based studies that have indicated that non-drinkers have a higher risk of psychological distress and depression than moderate drinkers^{8–12}. However, unlike those studies, our study sample may have included individuals among the stable non- or occasional drinkers who do not drink because of inherited aldehyde dehydrogenase (ALDH) deficiency; the atypical ALDH2 allele was rarely found in Caucasians²⁴ whereas it appeared in about half of Japanese²⁵. In fact, a previous Japanese study showed that former drinkers account for only 12% of non- or occasional drinkers²⁶. Therefore, the influence of former drinkers who had abstained from alcohol because of health issues or previous drinking problems on the results of stable non- or occasional drinkers would be limited. Racial differences in ALDH2 genetic polymorphisms need to be considered and the background of individuals who do not drink regularly needs to be assessed to derive a more precise estimation of the association between changes in drinking habits and psychological distress among non- or occasional drinkers in Asian countries, including Japan.

The present findings among males, indicating stable non- or occasional drinkers and new moderate drinkers had higher risk of psychological distress than new light drinkers, may also be explained by the fact that the mean GHQ-12 score had greatly decreased from baseline to follow-up among the new light drinker group but not among the other two groups (see Table 3). Despite unclear reasons for this finding, one should consider the possibility that small amounts of alcohol use may have some psychosocial benefits, such as social integration²⁷, which resultantly have positive effects on mental health²⁸. Another

possibility is that some new light drinkers started drinking because they resolved their reasons opposing regular drinking. For example, a previous study of middle-aged Japanese men²⁹⁾ showed that about 70% of former drinkers and about 30% of never and occasional drinkers took medication. Therefore, some individuals in the present study may have started drinking regularly because of their health conditions, which had led them to reduce their alcohol consumption, improved during the follow-up period. Resolving reasons not to drink regularly may have helped reduce psychological distress among some new light drinkers. However, we did not obtain information on why new light drinkers started drinking during one-year follow-up. Therefore, it is impossible to determine the likelihood of the possibility described above. Further studies taking into account the backgrounds of changes in drinking habits are needed.

In contrast, there was no significant association between changes in drinking habits and psychological distress for female participants. This may be attributable to sex differences in the reasons for alcohol abstinence. Many men abstain because of previous drinking-related experiences, such as concerns about problems caused by drinking or adverse effects on their behavior. Conversely, many women abstain because they are uninterested in alcohol or do not like its taste³⁰⁾. Additionally, because women show a lower prevalence of alcohol-related problems³¹⁾, fewer women need to abstain because of such issues. Furthermore, as women in Japan primarily take responsibility for household chores and child rearing, even in double-income households³²⁾, many women abstain because of their social roles. Thus, less women than men abstain to prevent alcohol-related problems or harmful effects. This may explain the insignificant association we found between changes in drinking habits and psychological distress among female participants. However, this could also have resulted from the small number of female participants who started drinking during the follow-up period. Further investigations are needed to confirm the present findings using a larger female sample.

This study has a number of limitations. First, the group of stable non- or occasional drinkers included lifetime abstainers, former drinkers, and occasional drinkers. There were various reasons why former drinkers did not currently drink. For example, some had abstained because of physical disease, which is assumed to be associated with psychological distress. Occasional drinkers also exhibit different patterns of drinking; some may consume only a small amount of alcohol, whereas others may consume

large amounts of alcohol at a time. The questionnaire used in this study did not specify the quantity of alcohol for those who drank less than once a week. This diversity among participants in the stable non- or occasional drinker group may have confounded the present findings. Second, because we did not inquire on reasons why individuals did not drink regularly, we could not identify those who had abstained from alcohol at baseline. Therefore, the proportion of abstainers at baseline in each group could have affected the results in the present study. Third, some regular drinkers may have been categorized as non- or occasional drinkers through underreporting of alcohol consumption, which has been found in previous studies^{33, 34)}. This misclassification could have confounded our results for non- or occasional drinkers. Fourth, although there were no significant between-group differences in psychological distress at T1, there may have been changes in psychological distress during the long follow-up period. Some participants may have started drinking during the follow-up period to cope with their psychological distress. Thus, in this regard, the present findings should be interpreted with caution. Fifth, participants with high levels of psychological distress may have been less likely to respond to the T2 survey; alternatively, they may have been excluded from the analyses because of missing responses. Therefore, the risk of psychological distress could have been underestimated. However, we found no significant difference in psychological distress at T1 between responders and non-responders. Sixth, we used the new light drinker group as the reference to evaluate the risk of psychological distress in the stable non- or occasional drinker group and the new moderate drinker group. This may have led to overestimation of the risk for both groups, because the mean GHQ-12 score among the new light drinker group had greatly decreased from baseline to follow-up, and the backgrounds of changes in drinking habits may have confounded the results. Finally, this study was based on surveys conducted at one company, and thus the generalizability of our findings may be limited. However, using data from a single company potentially reduces sample variability in socioeconomic status.

This study revealed that alcohol consumption was associated with psychological distress in individuals who started regularly drinking 80 g/wk of alcohol. This finding suggests that occupational health staffs need to monitor the mental health of men who start regularly drinking 80 g or more of alcohol per week. This threshold is much lower than actual levels of alcohol consumption among candidates for brief interventions⁵⁻⁷⁾, which are considered

effective to reduce alcohol consumption. Thus, it is necessary to focus not only on alcohol consumption but also on changes in drinking habits and onset. This is especially important for individuals who begin drinking regularly and increase their alcohol consumption to 80 g/wk or more over a short period, as such changes can lead to psychological distress. However, any long-term beneficial effects of starting drinking on mental health are still unclear. Long-term follow-up studies are needed to confirm the present findings.

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