

## Evaluation of Relationships among Occupational Stress, Alcohol Dependence and Other Factors in Male Personnel in a Japanese Local Fire Fighting Organization

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Recent large-scale disasters have made middle-ranked fire defense officers responsible for routine fire fighting activities, and a tendency of alcohol dependence associated with other stressful problems is noted in Japan. We assessed the alcohol dependence tendency with the alcohol use disorders identification test (AUDIT) in firefighters. Occupational stress, depression and other factors were evaluated with the brief job stress questionnaire, Center for Epidemiologic Studies depression scale, K10 and a face sheet. Subjects were 294 male personnel in a local fire defense headquarters, and 246 of them (83.4%) answered effectively. Data were analyzed first with univariate analysis between the AUDIT score and other items, and then with multivariate analysis of the AUDIT score as a dependent variable and other items as independent variables. The AUDIT score (mean  $\pm$  SD) in the 246 respondents classified by age ranges was  $7.9 \pm 5.4$  points (the lowest, 0 points; the highest, 27 points). The multivariate analysis showed significant correlations of the AUDIT score with the workplace environment ( $P = 0.003$ ) and the rank of work ( $P = 0.019$ ). The present survey was cross-sectional, and we could not clarify the subjects' past drinking states and applicability of the results to the whole Japan personnel. It is necessary to further investigate the relationship between alcoholism and depression in the present subjects. As a pilot study, we first clarified the state of alcohol dependence in personnel in a Japanese local fire fighting organization, and examined related factors.

**Key words:** alcohol dependence; depression; firefighter; occupational stress

As a characteristics of the alcohol-drinking behavior in Japan, many persons have a habit of drinking to fall asleep more easily. The Japanese shift workers have a stronger tendency of drinking to fall asleep more easily as compared with non-shift workers

(Ohira et al., 1969). Japanese regular fire departments are operating 24 h a day, when someone is on administrative leave, the working schedules of other members need to be adjusted, and, accordingly, the burden is heavier in smaller-scale fire headquarters.

Abbreviations: AUDIT, alcohol use disorders identification test; CES-D, center for epidemiologic studies depression scale

Staff of the Japanese regular fire departments are mostly male (Fire Disaster Management Agency, <http://www.fdma.go.jp/en/>). In Japan, however, the state of alcohol dependence has not been reported in fire department personnel. Also, relevant studies reported a relationship between such dependence and posttraumatic stress disorder (van der Velden et al., 2008; Chiu et al., 2011). But very few described the relationship of alcohol dependence with general occupational stress (Murphy et al., 1999), and such reports have not been published in Japan. In fire stations established and operated by a local, municipal, broader-based government, some personnel are on sick leave due to alcohol dependence. Thus, it is a major issue to take some measures for problems regarding alcohol dependence. To clarify the tendency of alcohol dependence in firefighters, we analyzed the relationship among alcohol dependence, occupational stress, depression and other factors for Japanese local male firefighters.

## Subjects and Methods

We conducted a self-rating questionnaire survey involving 294 male personnel in the Fire Department, Administrative Management Society of the Greater Western Region of Tottori Prefecture, a local fire defense headquarter in Japan, consisting of Firefighters, Assistant Fire Sergeants, Fire Sergeants, Fire Lieutenants, Fire Captains and Battalion Chiefs. Female personnel were excluded because most of the personnel were males. To evaluate the tendency of alcohol dependence in the subjects, we performed the alcohol use disorders identification test (AUDIT). To assess their occupational stress, we used the brief job stress questionnaire, Center for Epidemiologic Studies depression scale (CES-D), K10 and a face sheet (age, length of service, assignment of work, rank of work, presence of living children, presence of living partners, presence of persons who need care, presence of low-back pain, tobacco dependence screener and body mass index).

## AUDIT

The AUDIT was developed by Babor and associates in 1992 as a screening test for alcohol dependence. This test includes 10 items called the core AUDIT, which is employed worldwide (Babor et al., 1992). We used its Japanese version translated under specialist's supervision (Hiro, 2000). As for the cutoffs of the AUDIT, persons with a score of 8 points or higher, used as a measure against drink-driving by the Japanese police, were suspected as having a hazardous drinking problem, and those with a score of 15 points or higher were suspected as having alcohol dependence (Cho, 2011), as fire department personnel often use a car in their daily business.

## Brief job stress questionnaire

The brief job stress questionnaire developed by Japanese Professor Teruichi Shimomitsu and others (Department of Preventive Medicine and Public Health, Tokyo Medical University, [http://www.tmu-ph.ac/topics/stress\\_table.php](http://www.tmu-ph.ac/topics/stress_table.php)) to clarify the generation of stress, is widely used in Japan to measure the following factors: 9 factors possibly responsible for stress (the quantity of psychological stress, quality of psychological stress, physical stress, human relationship, workplace environment, job control, skill utilization, job suitability and rewarding work); 6 factors of physical and mental responses caused by stress (vitality, frustration, fatigue, anxiety, depression and complaints regarding the body) and 4 other factors influencing stress (the support of a supervisor, colleagues, family and friends). To clarify occupational stress, the occupational stress questionnaire created by the National Institute for Occupational Safety and Health (Kawakami and Haratani, 1998) is often used, but, in the present study, we used the brief job stress questionnaire, because this questionnaire can be filled in straightforwardly in a short time.

## CES-D

The CES-D developed by Radolf to screen for depression is employed worldwide (Radoloff, 1977).

In the present study, we used its Japanese version (Shima et al., 1985). Persons with a score of 16 points or higher were regarded in early studies as having depression.

**K10**

Kessler and associates developed K10, a more sensitive screening test for depressive disorder and anxiety disorder (Kessler et al., 2002), than the general health questionnaire, a conventionally standard screening test. In the present study, we used the Japanese translation of K10 (Furukawa et al., 2002). We used both CES-D and K10, because CES-D scores in the Japanese tend to be higher than in Westerners (Iwata, 2009).

**Data analysis**

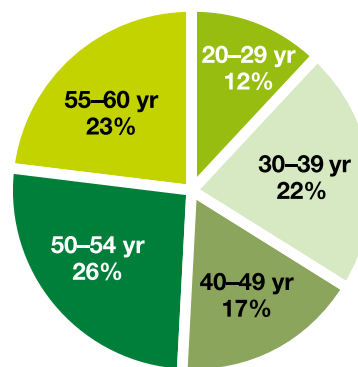
All analyses were conducted with SPSS for 19.0 (SPSS Japan, Tokyo, Japan). We first determined the coefficient of Spearman’s rank correlation between the AUDIT score and other items, and then multiple regression analysis with the AUDIT score as a dependent variable and the other items as independent variables.

**Results**

Of the 294 subjects, 246 provided effective answers (83.4%). The proportions of the respondents by age ranges are shown in Fig. 1: 12.0% (*n* = 29) from 20 to 29 years, 22% (*n* = 54) from 30 to 39 years, 17% (*n* = 42) from 40 to 49 years, 26% (*n* = 65) from 50 to 54 years and 23% (*n* = 56) from 55 to 60 years.

**Actual trend of alcohol dependence**

The age-classified AUDIT scores of the respondents are shown in Table 1. The mean score ± SD was 7.9 ± 5.4 points, the lowest being 0 points and the highest being 27 points. The age-ranged AUDIT scores were further classified into 3 ranks: Zone I (0–7 points), Zone II (8–14 points) and Zone III/IV

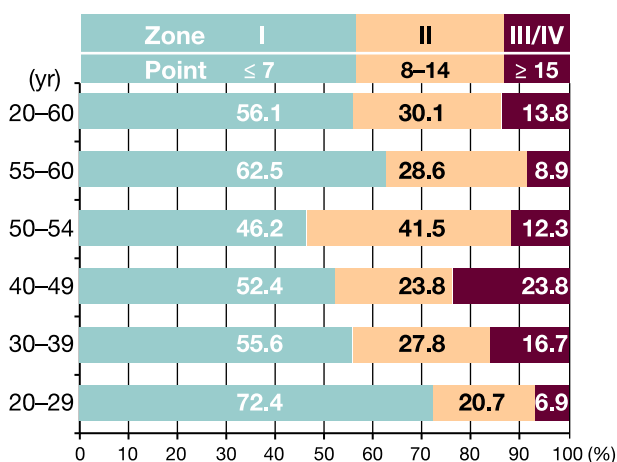


**Fig. 1.** Age structure of the subjects. Age ranges in the increasing order are shown from the top of the circle clockwise, with proportions in %.

**Table 1. Age-distribution of AUDIT scores**

Age range (yr)	AUDIT score (mean ± SD)
20–29	6.0 ± 5.1
30–39	7.9 ± 5.6
40–49	8.9 ± 5.8
50–54	8.7 ± 5.7
55–60	7.3 ± 4.7
20–60	7.9 ± 5.4

AUDIT, alcohol use disorders identification test.



**Fig. 2.** AUDIT scores classified by point ranks and age ranges of effective respondents (*n* = 246). The mean proportion of respondents in Zones I, II and III/IV is 56.1%, 30.1% and 13.8%, respectively. AUDIT, alcohol use disorders identification test.

(15–40 points) (Fig. 2). The proportions of subjects in Zones I, II and III/IV were 56.1, 30.1 and 13.8%, respectively. In the coefficient of Spearman’s rank

correlation, there was no correlation between age and AUDIT scores ( $P = 0.071$ ).

### **Alcoholism related to occupational stress, depression and other factors**

Table 2 shows items correlated with the AUDIT score on Spearman's rank correlation. The AUDIT score was significantly correlated with the following items: presence of living children ( $r = -0.154$ ,  $P = 0.03$ ), tobacco dependence screener ( $r = 0.153$ ,  $P = 0.039$ ), K10 ( $r = 0.140$ ,  $P = -0.031$ ), workplace environment ( $r = 0.127$ ,  $P = 0.047$ ), rewarding work ( $r = 0.161$ ,  $P = 0.011$ ) and complaints regarding the body ( $r = 0.140$ ,  $P = 0.028$ ). Table 3 shows the results of multiple regression analysis with the AUDIT score and other items. The AUDIT score was significantly

**Table 2. Items showing significant relationships with AUDIT scores (nonparametric test) on univariate analysis**

Item	$r$	$P$ value (each side)
Presence of living children	-0.154	0.030*
Tobacco dependence screener	0.153	0.039*
K10	0.140	0.031*
Brief job stress questionnaire		
Workplace environment	0.127	0.047*
Rewarding work	0.161	0.011*
Complaints regarding the body	0.140	0.028*

AUDIT, alcohol use disorders identification test.

$r$ , coefficient of Spearman's rank correlation.

\* $P < 0.05$ .

**Table 3. Results of multiple regression analysis of each item and the AUDIT scores**

Item	Standardized partial regression coefficient ( $\beta$ )	$P$ value
Workplace environment	0.281	0.003**
Rank of work	-0.223	0.019*

AUDIT, alcohol use disorders identification test.

\*  $P < 0.05$ .

\*\*  $P < 0.001$ .

Coefficient of multiple correlation,  $R$ , 0.366.

Coefficient of determination (adjusted for degrees of freedom), 0.116.

related to the workplace environment ( $P = 0.003$ ) and the rank of work ( $P = 0.019$ ).

## **Discussion**

The present survey revealed that the proportion of respondents with an AUDIT score  $\geq 8$  and  $\geq 15$  points was 43.9 and 13.8%, respectively. In a general Japanese adult population, the proportion of men with lifetime drinking, weekly drinking and daily drinking was 95.1, 64.4 and 36.2%, respectively (Osaki et al., 2005). In this population, the proportion of those with an AUDIT score  $\geq 12$  and  $\geq 15$  points was 11.1 and 5.1%, respectively (Osaki et al., 2005). They also reported that, in 2008, the proportion of male regular employees with an AUDIT score  $\geq 12$  points was 11.8% (Osaki et al., 2011). The AUDIT score was higher in the present survey than the above-mentioned studies, which indicated that persons with drinking problems or alcohol dependence were prevalent in the present subjects. A positive correlation was reported between alcoholism and depression (National Hospital Kurihama Medical and Addiction Center, <http://www.kurihama-med.jp/english.html>), and the univariate analysis performed in the present survey revealed that the AUDIT score had a relationship with the K10 score, but did not reveal that the AUDIT score had a relationship with the CES-D score. Since the present survey was cross-sectional, it is impossible to specify a cause-and-effect relationship between alcohol problem and depression. Based on these findings, we considered it necessary to further investigate the relationship between alcoholism anxiety disorder and depression in the present subjects. Anxiety disorder contains acute stress disorder and posttraumatic stress disorder, and so we considered it necessary to further investigate the relationship between alcoholism and them. In addition, the AUDIT score had a relationship with the presence of living children: personnel living with children have to take care of or play with children on off-duty days or holidays, which makes their opportunity of alcohol drinking less and the

AUDIT score lower. The reason of no association between the AUDIT score and marriage seemed to be derived from the fact that 89.9% of the subjects were married. The association of the AUDIT score and tobacco dependence screener score and higher smoking rates of alcohol-dependent patients were reported (Nakajima et al., 2004). In the present survey, we observed high AUDIT scores, and suspected even higher tobacco dependence screener score. The multiple regression analysis showed a relationship between the AUDIT score and workplace environment surrounding them. Workplace environment, a job stressor, reflects the level of first aid at the time of emergency or rescue, and the level of office work when personnel are on standby. For this reason, from the present survey, we suspected that a higher AUDIT score indicates poorer workplace environment. Similar results obtained in another study (Murphy et al., 1999) also indicated that higher AUDIT scores would be associated with lower ranks of work, possibly because many young personnel are engaged in fire fighting and prevention, as well as first aid. Such personnel are mostly on duty for 24 h a day, thereby increasing the length of time to consume alcohol. It is now necessary to conduct investigations for personnel in other Japanese fire fighting organizations to clarify their drinking states, and examine whether or not similar results will be obtained.

The present survey was conducted in personnel in a Japanese local fire fighting organization. It is unclear whether the results are applicable to fire department personnel throughout Japan. Also, since this survey was cross-sectional, we could not clarify the subjects' drinking states in the past. As a pilot study, we first clarified the state of alcohol dependence in personnel in a Japanese local fire fighting organization, and examined other related factors.

*Acknowledgments:* We acknowledge the cooperation of the personnel in the Fire Department, Administrative Management Society of the Greater Western Region of Tottori Prefecture, Japan, and those in charge of the investigation.

## References

- 1 Babor TF, de la Fuente JR, Saunders J, Grant M. Programme on substance abuse. AUDIT the alcohol use disorders identification test: guidelines for use in primary health care. Geneva: WHO; 1992.
- 2 Chiu S, Niles JK, Webber MP, Zeig-Owens R, Gustave J, Lee R, et al. Evaluating risk factors and possible mediation effects in posttraumatic depression and posttraumatic stress disorder comorbidity. *Public Health Rep* 2011;126:201–209.
- 3 Cho T. [Alcohol use disorders and drink-driving]. *Nihon Arukoru Yakubutsu Igakkai Zasshi* 2011;46:157–169 (in Japanese).
- 4 Department of Preventive Medicine and Public Health [Internet]. Tokyo: Tokyo Medical University; c-2012 [cited 2012 Mar 2]. Brief job stress questionnaire; [1 screen]. Available from; [http://www.tmu-ph.ac/topics/stress\\_table.php](http://www.tmu-ph.ac/topics/stress_table.php) (in Japanese).
- 5 Fire Disaster Management Agency [Internet]. Tokyo: The Ministry of Internal Affairs and Communications; c-2012 [cited 2012 Feb 27]. FDMA home; [1 screen]. Available from: <http://www.fdma.go.jp/en/>
- 6 Furukawa T, Ohno Y, Uda H, Nakane Y. Kenkyu kyoryoku hokokusho. Ippan jinkochu no seishin shikkan no kanbenna sukuriningu ni kansuru kenkyu [Collaborative study report: research on easy screening for mental illnesses in a general population]. In: Kawakami N, ed. Koseirodoshu kosei rodo kagaku kenkyuhi hojokin. Kosei rodo kagaku tokubetsu kenkyu jigyo. Heisei 14 nendo sokatsu/buntan kenkyu hokokusho. Kokoro no kenko mondai to taisaku kibana no jittai ni kansuru kenkyu [Ministry of Health, Labour and Welfare Health and Labor Sciences Specific Research Project with Grant in Health and Labor Sciences Research. Fiscal 2002 general and collaborative study report: research on mental health problems and actual situations of the measures base]. 2003 (in Japanese).
- 7 Hiro H. [WHO/AUDIT: the alcohol use disorder identification test: index of drinking problems. Japanese version.] Tokyo: Chiba Test Center; 2000 (in Japanese).
- 8 Iwata N. Psychometrics and cultural differences: how are responses to rating scales different between Japanese people and Westerners? *Sutoresu Kagaku* 2009;24:206–214 (in Japanese).
- 9 Kawakami K, Haratani T. [A new method to evaluate occupational stress: the occupational stress questionnaire of the NIOSH, National Institute of Occupational Safety and Health.] *Sutoresu Kagaku* 1998;13:19–24 (in Japanese).
- 10 Kessler RC, Andrews G, Colpe LJ, Hiripi E, Mroczek DK, Normand SL, et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol Med* 2002;32:959–976.
- 11 Murphy SA, Beaton RD, Pike KC, Johnson LC. Oc-

- cupational stressors, stress responses, and alcohol consumption among professional firefighters: A prospective, longitudinal analysis. *Int J Stress Manag* 1999;6:179–195.
- 12 Nakajima K, Furune T, Sakaoka U, Tanaka R. [An investigation into habits in a psychiatric hospital and strategies used to deal with the situation]. *Rinsho Seishin Igaku* 2004;33:805–809 (in Japanese).
  - 13 National Hospital Kurihama Medical and Addiction Center [Internet]. Yokosuka: c2010 [cited 2012 Mar 2]. English home page [about 1 screen]. Available from: <http://www.kurihama-med.jp/english.html>
  - 14 Ohira M, Ohta T, Kato S, Yoshida T, Uehata T, Goto M, et al. A study on the habits of alcohol-drinking in field of occupational health. *Sangyo Igaku* 1969;11:553–562 (in Japanese with English abstrat).
  - 15 Osaki Y, Matsushita S, Higuchi S. [Epidemiology of alcohol problems in Japan: emphasis on workers and workplaces]. *Sangyo Seishin Hoken* 2011;19:75–79 (in Japanese).
  - 16 Osaki Y, Matsushita S, Shirasaka T, Hiro H, Higuchi S. [Nationwide survey of alcohol drinking and alcoholism among Japanese adults]. *Nihon Arukoru Yakubutsu Igakkai Zasshi* 2005;40:455–470 (in Japanese).
  - 18 Radloff LS. The CES-D Scale: a self-report depression scale for research in the general population. *Appl Psychol Meas* 1977;1:385–401.
  - 19 Shima S, Shikano T, Kitamura T. A new self-rating depression scale. *Seishin Igaku* 1985;27:717–723 (in Japanese).
  - 20 van der Velden PG, Kleber RJ, Koenen KC. Smoking predicts posttraumatic stress symptoms among rescue workers: a prospective study of ambulance personnel involved in the Enschede Fireworks Disaster. *Drug Alcohol Depend* 2008;94:267–271.

*Received July 8, 2012; accepted August 10, 2012*

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