
Article

Prevalence and Trends in Alcohol Dependence and Alcohol Use Disorders in Japanese Adults; Results from Periodical Nationwide Surveys

Yoneatsu Osaki^{1,*}, Aya Kinjo¹, Susumu Higuchi², Hiroshi Matsumoto³, Takefumi Yuzuriha⁴, Yoshinori Horie⁵, Mitsuru Kimura², Hideyuki Kanda⁶, and Hisashi Yoshimoto⁷

¹Division of Environmental and Preventive Medicine, Faculty of Medicine, Tottori University, Yonago, Tottori, Japan, ²National Hospital Organization Kurihama Medical and Alcohol Center, Yokosuka, Kanagawa, Japan, ³Department of Legal Medicine, Osaka University Graduate School of Medicine/Faculty of Medicine, Suita, Osaka, Japan, ⁴National Hospital Organization Hizen Psychiatric Center, Yoshinogari, Saga, Japan, ⁵Sanno Medical Center, Clinical Research Centers for Medicine, International University of Health and Welfare, Minato-ku, Tokyo, Japan, ⁶Department of Environmental Medicine and Public Health, Faculty of Medicine, Shimane University, Izumo, Shimane, Japan, and ⁷Primary Care and Medical Education, Graduate School of Comprehensive Human Sciences, Majors of Medical Science, University of Tsukuba, Tsukuba, Ibaragi, Japan

*Corresponding author: Division of Environmental and Preventive Medicine, Faculty of Medicine, Tottori University, 86 Nishi-cho, Yonago, Tottori 683-8503, Japan. Tel.: +81-859-38-6103; Fax: +81-859-38-6100; E-mail: yoneatsu@med.tottori-u.ac.jp

Received 18 September 2015; Revised 27 December 2015; Accepted 7 January 2016

Abstract

Aims: Nationwide surveys to clarify the characteristics and trends of the drinking behavior of Japanese adults were carried out in 2003, 2008, and 2013.

Methods: These were periodical cross-sectional surveys. Subjects were chosen through a stratified two-stage random sampling method. The surveys included drinking frequency and amount, ICD-10 alcoholism diagnostic standards, questionnaire for the determination of harmful alcohol use (AUDIT: Alcohol Use Disorders Identification Test). In 2003, the surveys obtained responses from 2547 people (73% response rate); in 2008, 4123 people (55% response rate); and in 2013, 4153 people (59% response rate).

Results: The proportion of lifetime experience of alcohol dependence diagnosed by ICD-10 was 1.9% for male and 0.2% for female, and the estimated number of patients was 1.07 million. The declining trends were observed in the percentage of daily drinkers and the amount of alcohol consumed per week for male. The lowering of the age for consuming their first alcoholic drink and their first drunken experience was observed among female. The gender difference of prevalence of problem drinking is getting smaller. The binge drinking and heavy episodic drinking were observed especially younger generation. The only small proportion of patients with alcohol dependence had received specialized medical care, whereas the many of these visited medical institutions and health screening.

Conclusions: The survey observed many hidden alcoholic patients, and showed the possibility that the healthcare facilities and health screening became the place of screening and intervention for alcohol dependence.

INTRODUCTION

The consumption of alcohol is not only a health issue, it is also associated with a number of other social issues such as traffic accidents, binge drinking, violence, crime, domestic violence, child abuse, and suicide. The social costs of alcohol use disorders are enormous (World Health Organization, 2014). Alcohol consumption is one of the main factors concerning health, and its influence is substantial (World Health Organization, 2009). The World Health Organization has been focusing on this problem, including adopting the Global Strategy to Reduce Harmful Use of Alcohol during the General Assembly in 2010 (World Health Organization, 2010a). It is hoped this policy will strengthen measures to reduce harmful alcohol consumption in countries around the world.

In Japan, The Ministry of Health, Labor and Welfare took up this issue as one area of the national health movement starting in the year 2000 called 'Healthy Japan 21', and while there have been efforts to reduce harmful drinking, this program has not achieved great results in adults with drinking problems (Ministry of Health, Labor and Welfare, 2011).

Alcohol consumption per capita in Japanese citizens 15 years of age and older is not large compared to elsewhere in the world. However, a nationwide survey conducted in Japan in 2003 showed that there are many patients with potential for alcoholism (Osaki *et al.*, 2005). There have been no similar representative surveys in Japan since 2003 and the subsequent situation is not clear.

In the National Health and Nutrition Examination Survey conducted annually by the Ministry of Health, Labor and Welfare, it is possible to learn the status of alcohol consumption since 1986, but because of issues such as the definition of drinking and the reliability of the information, it has been pointed out that this data might not necessarily reflect the actual situation (Osaki *et al.*, 2004).

We have conducted nationwide surveys in 2008 and 2013 using the same survey and methodology as the survey conducted in 2003, compared the results, and examined the trends.

The purpose of this study is to clarify the drinking behavior in Japan adults, determine the frequency of alcoholism, and understand the alcohol-related problems. It will be possible to provide information such as the potential number of alcoholics, and the frequency of alcohol-related problems. It will also provide the useful information for establishing Japanese control measure for alcohol-related problems.

METHODS

The research method used was a cross-sectional study. The subjects were adults randomly selected from all over the country. The survey method used was a home visit to the survey respondents, where an interview was conducted by trained investigators.

Subjects

The subjects were selected using a stratified two-stage random sampling. The strata were determined by first dividing the survey districts into 11 areas [Hokkaido, Tohoku, Kanto, Hokuiku, Tosan (Yamanashi, Nagano, and Gifu), Tokai, Kinki, Chugoku, Shikoku, northern Kyushu, and southern Kyushu] and then into five groups classified by municipality size [large cities (14), cities with populations greater than 300,000, greater than 100,000, less than 100,000, and smaller towns and villages]. The survey districts were selected from each stratum in proportion to the population of 20 years of age or older. The survey

conducted in 2003 gathered data from a total of 3,500 subjects, in 2008, 7,500 subjects, and in 2013, 7,052 subjects.

Survey contents

The survey criteria used were as follows, ICD-10 alcoholism diagnostic criteria to identify alcoholism, screening questionnaires to determine harmful use of alcohol or alcoholism [Cut down, Annoyed, Guilty, Eye-opener (CAGE), Kurihama Alcoholism Screening Test (KAST), the Alcohol Use Disorders Identification Test (AUDIT)], gender, age, educational status, marital status, occupation, household income, smoking status, sleep disorder status, the use of sleeping medication, imbibing a nightcap before sleep, age of first drink, age when habitual drinking started, drinking frequency, amount of alcohol consumed, the maximum amount of alcohol consumed per day, self-awareness of a flushing reaction, and whether or not they have experienced any damage due to problem alcohol consumption by other people (alcohol-related harassments).

Evaluation criteria

The diagnostic criteria for dependence in the ICD-10 standard for alcoholism are based on alcohol use over the past year (World Health Organization, 1992).

The CAGE questionnaire is an acronym for 'Cut down on drinking', 'Annoyed by criticism of drinking', 'feeling Guilty about drinking', and 'Eye-opener (morning drinking)'. It is a simple diagnostic tool where if a patient scores positive for two or more items alcoholism is suspected (Mayfield *et al.*, 1974). The KAST test is an acronym for the Kurihama Alcoholism Screening Test where alcoholism is suspected if a patient obtains a score of two or more (Saito and Ikegami, 1978). The AUDIT test is an acronym for Alcohol Use Disorders Identification Test. Its cutoff point is higher in Japan than in other countries (Barry and Fleming, 1993; Allen *et al.*, 1997), and a score of 10–14 or higher places a patient in the problem drinking group (Hiro and Shima, 1996). This study calculates the percentage of patients who score 12 or more points, 15 or more points (potential alcoholism), and 20 or more points (suspected alcoholism).

Binge drinking (opportunistic heavy drinking) is defined as drinking more than 60 g of alcohol in one drinking occasion one or more times a week (World Health Organization, 2010b). Risky drinking (dangerous drinking) is defined as the consumption of 280 g or more in 1 week for men and 168 g or more for women (Department of Mental Health and Substance Dependence, 2000). Hazardous drinking (drinking which has the potential to adversely affect health) is defined as the consumption of 40 g or more per day for men and 20 g per day or more for women (Healthy Japan 21 – 2nd Plan) (Health Science Council, 2012). Heavy episodic drinking is defined as the consumption of 60 g or more in one drinking occasion over the past 30 days (World Health Organization, 2014).

Survey procedures and response rates

The 2008 survey was conducted in June, and the 2013 survey was conducted in July. A survey request document was sent to the municipal office after the survey district was selected at random. Subjects were randomly selected from the resident register at the municipal office by the investigator. The subject was asked whether or not they would participate in the survey, and, if agreement was obtained, the investigator visited their place of residence and conducted the survey.

The participant numbers and response rates for each survey were: 2,547 people (73% response rate) in 2003, 4,123 people (55% response rate) in 2008, and 4,153 people (59% response rate) in 2013.

Statistical method

The mean values and ratios for each item were calculated using the general linear model (GLM) for age-adjusted values and ratios giving a 95% confidence interval. Age-adjusted estimates were determined using the Japanese population in five-year age groups.

The general linear model was calculated using the presence or absence of each addiction/dependency as the dependent variable, factors such as survey year and gender as fixed factors, and age as the covariate. Trends were examined by treating the survey year as a fixed factor in the general linear model. Statistical analysis was performed using IBM SPSS Statistics version 19.0 for Windows (IBM Corp., Somers, NY, USA).

Ethical considerations

This study obtained the approval of the ethics committee at the Kurihama Medical and Addiction Center. Consent was obtained from the subjects during the investigator's visit after providing them with an explanation of the purpose of the investigation, its content, and how personal information would be protected. Since the survey data excluded personal information had sent to researchers, the research member cannot know the personal information of the respondents.

RESULTS

Socioeconomic indicators

Table 1 shows the socioeconomic indicators of the respondents. The average age of the 2013 survey respondents is high, so comparisons of average age and ratios were age-adjusted. Each successive survey has found an increase in the number of years of schooling for both men and women. The proportion of women in regular employment is lower than the proportion of men, but the rate in women has increased with each survey (Table 1).

Drinking behavior

Table 1 shows the annual changes in the main indicators related to drinking behavior. The drinking rate for men was higher than women in Japan. The proportion of those drinking in the past year was higher among men than women, and no statistically significant changes were seen for both men and women. There was a downward trend in the proportion of men who drink every day. The proportion of those who have a nightcap 3 days or more in a 1 week period was low for both men and women, and in men it is declining. The average age of first alcoholic drink was younger in men; for women this has tended to decline each time a survey has been conducted. The average age of the start of habitual drinking was on a downward trend for both men and women. The average age of first drunken experience was younger in men, and for women this has tended to decline with each survey. The overall difference between men and women is becoming quite small, especially among younger age groups.

The average number of drinking units consumed per week was higher for men, but was on the decline. The average AUDIT score was higher in both men and women in the survey conducted in 2003, after which it declined in 2008 and has remained flat since. Men had a higher proportion of risky drinking, but this also was on the decline. There was almost no difference in the proportion of people who show a flushing response between men and women, but the 2013 survey showed that women have a slightly lower tendency.

Status of problem drinkers

Table 2 shows the proportions and estimates of problem drinkers calculated using a variety of criteria. The proportions of those who have had a lifetime experience of alcoholism and those who were currently alcoholic according to ICD-10 diagnostic criteria were low for both men and women, with the proportion for men being higher. The figures for the Japanese population as a whole estimate that 1.07 million people had a lifetime experience of alcoholism in 2013 (940,000 men and 130,000 women) and that the current number of alcoholics is 570,000 (500,000 men and 70,000 women). Because these percentages are small, the trends were not clear. The surveys that gave the lowest estimates were the 2008 survey (600,000 people with a lifetime experience of alcoholism) and the 2003 survey (260,000 people currently alcoholic). This indicates that there are hundreds of thousands of alcoholics in Japan at least (Table 2).

When the results of some of the screening tests for problem drinking were analyzed using a comparatively common cutoff value, the estimates were 5–7% for men and approximately 1% for women (AUDIT 15 points or more, CAGE/KAST 2 points or more). In terms of population estimates, this corresponds to approximately 2–3 million men and 400–800 thousand women. The corresponding proportions of risky drinking and hazardous drinking were higher. Binge drinking had higher proportions among young people and men, with 12.0% of men and 2.2% of women in the 2013 survey. The proportion of heavy episodic drinkers was high, with 30.5% of men and 7.2% of women in the 2013 survey.

Advice on controlled alcohol use to problem drinkers

Table 3 shows the results of an analysis of the 2013 survey concerning the relationship between the presence or absence of problem drinking and a desire for moderation in drinking/abstinence, consultation with a medical institution or health checkup, and the advice on controlled alcohol use from a medical institution (Table 3).

While the proportion of people who want to stop drinking among alcoholics was high (14% for lifetime experience, 22% for currently alcoholic), the proportion of risky drinkers was not high (only 0.8%). The proportion of people who want to reduce their alcohol consumption was high with all kinds of problem drinkers. However, the proportion among patients who had received treatment for alcoholism in the past was low (14% for lifetime experience, 17% for currently alcoholic). There were no women who had received treatment for alcoholism among survey respondents.

The proportion of people who had visited a medical institution or had a health examination in the past year was high, even for those with a drinking problem, and there was almost no difference between alcohol use disorders and other groups. However, the proportion of those who did not receive a medical interview about drinking at a medical institution was higher in women and drinkers without alcohol use disorders than in alcoholics. The proportion of drinkers without alcohol use disorders who were advised by their doctor for moderation in drinking was low. Also, the proportion of women and drinkers without alcohol use disorders who did not receive moderation in drinking guidance during a health checkup was high.

Many men experienced a doctor telling them they suffered abnormal liver function test due to alcohol consumption, and this was especially high in alcoholics. However, the proportion of those who had received treatment for impairment of liver function was low with approximately half of non-alcoholic problem drinkers receiving treatment.

Table 1. Sociodemographic characteristics and drinking behaviors of subjects

	Year	Male		Female		Total		Testing		
		Value	95% CI	Value	95% CI	Crude rate	95% CI	Male vs female	Trend in survey year	
									Male	Female
Average age	2003	53.2	52.3–54.2	52.6	51.8–53.5	52.9	52.3–53.5	0.35		
	2008	53.9	53.2–54.7	52.5	51.8–53.2	53.1	52.6–53.6	<0.01	<0.01	<0.01
	2013	56.2	55.4–57.0	55.7	54.9–56.4	54.1	53.8–54.5	<0.01		
Drinking rate (during the previous 1 year)	2003	83.6%	81.5–85.7	62.5%	60.1–65.0	72.3%	70.4–74.0	<0.01		
	2008	82.2%	80.6–84.0	60.9%	59.1–62.8	70.7%	69.4–72.1	<0.01	0.80	0.39
	2013	82.9%	81.2–84.6	63.3%	61.4–65.1	72.0%	70.7–73.3	<0.01		
Daily drinking rate	2003	36.8%	34.2–39.5	7.4%	6.0–8.8	22.1%	20.6–23.5	<0.01		
	2008	32.0%	29.9–34.1	7.4%	6.3–8.5	19.8%	18.6–20.9	<0.01	<0.01	0.98
	2013	29.4%	27.3–31.5	7.3%	6.2–8.4	18.4%	17.2–19.5	<0.01		
Proportion of night cap (3 days or more per week)	2003	5.8%	4.6–7.1	1.4%	0.8–2.0	3.6%	3.0–4.3	<0.01		
	2008	5.3%	4.3–6.3	1.4%	1.0–1.9	3.4%	2.9–3.9	<0.01	0.04	0.38
	2013	4.2%	3.2–5.2	1.1%	0.7–1.6	2.7%	2.1–3.2	<0.01		
Average points of AUDIT	2003	5.9	5.6–6.1	2.2	2.1–2.4	4.1	3.9–4.2	<0.01		
	2008	5.1	4.8–5.3	1.7	1.6–1.8	3.4	3.3–3.5	<0.01	<0.01	<0.01
	2013	5.1	4.8–5.3	1.8	1.7–1.9	3.4	3.3–3.6	<0.01		
Average age of first drinking	2003	19.1	19.0–19.3	21.6	21.3–22.0	20.4	20.2–20.6	<0.01		
	2008	19.2	19.1–19.4	21.3	21.0–21.8	20.2	20.1–20.4	<0.01	0.14	0.02
	2013	19.0	18.9–19.2	21.0	20.7–21.3	20.0	19.9–20.2	<0.01		
Average age of starting regular drinking	2003	27.2	26.6–27.8	31.3	30.3–32.3	29.6	29.0–30.1	<0.01		
	2008	26.6	26.1–27.1	30.7	30.0–31.5	28.9	28.5–29.4	<0.01	<0.01	0.07
	2013	25.3	24.9–25.8	29.9	29.2–30.6	28.0	27.6–28.4	<0.01		
Average age of first heavy drinking	2003	23.8	23.2–24.3	25.8	25.0–26.6	25.1	24.6–25.5	<0.01		
	2008	23.8	23.4–24.2	24.5	23.9–25.2	24.4	24.0–24.8	<0.01	0.84	<0.01
	2013	23.6	23.2–24.1	24.2	23.6–24.8	24.3	23.9–24.6	<0.01		
Average consumption of alcohol per week among drinkers (1 unit = 10 g pure alcohol)	2003	17.2	16.1–18.3	4.4	3.8–5.0	10.8	10.1–11.5	<0.01		
	2008	14.6	13.7–15.5	4.2	3.8–4.7	9.5	8.9–10.0	<0.01	<0.01	0.89
	2013	14.7	13.8–15.6	4.3	3.8–4.8	9.5	8.9–10.0	<0.01		
Proportion of risky drinking (male 280 g or more/week female 168 g or more/week)	2003	23.6%	21.1–26.0	6.2%	4.5–7.8	14.8%	13.3–16.4	<0.01		
	2008	18.7%	16.7–20.6	5.6%	4.3–6.8	12.2%	11.0–13.4	<0.01	<0.01	0.13
	2013	18.6%	16.7–20.6	7.4%	6.1–8.7	13.0%	11.8–14.2	0.03		
Average years of education	2003	12.1	11.9–12.2	11.8	11.7–11.9	11.9	11.8–12.0	<0.01		
	2008	12.9	12.8–13.0	12.2	12.1–12.3	12.6	12.5–12.6	<0.01	<0.01	<0.01
	2013	13.3	13.2–13.4	12.7	12.6–12.8	13.0	12.9–13.1	<0.01		
Proportion of flusher	2003	43.1%	40.2–46.0	43.9%	40.9–46.9	43.5%	41.4–45.6	0.63		
	2008	42.3%	40.0–44.5	44.0%	41.8–46.3	43.2%	41.5–44.8	0.25	0.68	<0.01
	2013	41.4%	39.1–43.7	38.0%	35.8–40.3	39.7%	38.1–41.4	0.03		
Proportion of regular employment	2003	42.7%	40.3–45.1	14.7%	12.9–16.6	28.8%	27.3–30.4	<0.01		
	2008	44.2%	42.3–46.1	15.4%	14.0–16.9	29.8%	28.6–31.0	<0.01	0.49	<0.01
	2013	44.5%	42.6–46.4	18.6%	17.2–20.1	31.6%	30.4–32.8	<0.01		
Proportion of annual household income less than 400 million yen	2013	41.1%	38.9–43.2	41.6%	39.6–43.5	41.3%	39.8–42.8	0.73	–	–

Age/flusher-related alcohol consumption: only for those who have consumed alcohol, age-adjusted.

Volume of alcohol consumed: during the past year, age adjusted.

Table 2. Results of frequency and estimates for various problem drinking (2003, 2008, 2013)

	Male					Female					Total				
	Crude rate	Age-adjusted rate	95% CI of the proportion	Estimated number (in million)	95% CI of the estimated number	Crude rate	Age-adjusted rate	95% CI of the proportion	Estimated number (in million)	95% CI of the estimated number	Crude rate	Age-adjusted rate	95% CI of the proportion	Estimated number (in million)	95% CI of the estimated number
Alcohol dependence (ICD-10) lifetime experience															
2003	1.9%	1.5%	1.0–2.1%	0.75	0.5–1.04	0.1%	0.2%	0.0–0.7%	0.08	0–0.37	0.9%	0.8%	0.4–1.2%	0.83	0.50–1.41
2008	1.2%	1.0%	0.7–1.4%	0.52	0.35–0.70	0.2%	0.2%	0.0–0.5%	0.08	0–0.27	0.7%	0.6%	0.4–0.8%	0.60	0.35–0.97
2013	2.1%	1.9%	1.4–2.3%	0.94	0.71–1.16	0.2%	0.2%	0.0–0.6%	0.13	0–0.33	1.1%	1.0%	0.6–1.3%	1.07	0.71–1.49
Current alcohol dependence (ICD-10)															
2003	0.7%	0.5%	0.2–0.8%	0.26	0.10–0.40	0.0%	0.0%	0.0–0.3%	0.00	0.0–0.16	0.3%	0.3%	0.1–0.5%	0.26	0.10–0.56
2008	0.5%	0.5%	0.2–0.7%	0.23	0.10–0.35	0.1%	0.1%	0.0–0.4%	0.06	0.0–0.22	0.3%	0.3%	0.1–0.5%	0.29	0.10–0.57
2013	1.1%	1.0%	0.6–1.3%	0.50	0.30–0.66	0.1%	0.1%	0.0–0.4%	0.07	0.0–0.22	0.6%	0.5%	0.3–0.7%	0.57	0.30–0.88
AUDIT (12 points or more)															
2003	13.0%	13.5%	12.1–14.9%	6.68	5.99–7.38	1.5%	1.7%	0.4–3.0%	0.93	0.21–1.60	6.9%	7.0%	6.0–7.9%	7.61	6.20–8.98
2008	10.9%	10.5%	9.5–11.5%	5.28	4.78–5.78	1.2%	1.3%	0.4–2.3%	0.70	0.22–1.24	5.6%	5.3%	4.6–5.9%	5.98	5.00–7.02
2013	10.6%	10.2%	9.1–11.2%	5.16	4.59–5.65	1.3%	1.4%	0.4–2.3%	0.77	0.22–1.25	5.5%	5.3%	4.6–5.9%	5.93	4.81–6.90
AUDIT (15 points or more)															
2003	6.1%	6.4%	5.4–7.4%	3.17	2.68–3.67	0.7%	0.8%	0–1.7%	0.42	0–0.90	3.2%	3.4%	2.7–4.1%	3.59	2.68–3.97
2008	6.1%	5.9%	5.1–6.7%	2.95	2.57–3.37	0.8%	0.8%	0.1–1.5%	0.45	0.05–0.81	3.2%	3.1%	2.5–3.6%	3.40	2.62–4.18
2013	5.3%	5.1%	4.4–5.8%	2.56	2.22–2.92	0.6%	0.7%	0.0–1.4%	0.36	0.0–0.76	2.7%	2.6%	2.1–3.0%	2.92	2.22–3.68
AUDIT (20 points or more)															
2003	1.6%	1.6%	1.1–2.1%	0.78	0.54–1.04	0.2%	0.2%	0.0–0.7%	0.10	0.0–0.40	0.9%	0.8%	0.5–1.2%	0.88	0.54–1.08
2008	2.0%	2.1%	1.7–2.6%	1.04	0.86–1.31	0.3%	0.3%	0.0–0.7%	0.16	0.0–0.38	1.1%	1.1%	0.8–1.5%	1.20	0.86–1.69
2013	2.0%	2.0%	1.6–2.5%	1.01	0.81–1.26	0.2%	0.2%	0.0–0.3%	0.11	0.0–0.33	1.0%	1.0%	0.7–1.3%	1.12	0.81–1.59
Risky drinking (M ≥ 280 g/w, F ≥ 168 g/w)															
2003	19.6%	19.0%	17.3–20.8%	9.43	8.57–10.30	4.0%	4.2%	2.6–5.9%	2.26	1.38–3.14	11.2%	11.0%	9.8–12.2%	11.69	9.95–13.44
2008	15.3%	14.0%	12.8–15.3%	7.04	6.44–7.70	3.5%	3.4%	2.3–4.6%	1.82	1.24–2.49	8.9%	8.2%	7.4–9.1%	8.86	7.68–10.19
2013	15.6%	14.4%	13.1–15.7%	7.26	6.60–7.91	4.5%	4.6%	3.4–5.7%	2.48	1.85–3.10	9.5%	9.0%	8.1–9.9%	9.74	8.45–11.01
Hazardous drinking (M ≥ 40 g/d, F ≥ 20 g/d)															
2003	19.6%	19.0%	17.3–20.8%	9.43	8.57–10.30	5.8%	6.0%	4.3–7.7%	3.20	2.29–4.09	12.2%	12.0%	10.8–13.2%	12.63	10.86–14.39
2008	15.3%	14.0%	12.8–15.3%	7.04	6.44–7.70	5.3%	5.2%	4.0–6.4%	2.79	2.16–3.46	9.9%	9.2%	8.3–10.1%	9.83	8.60–11.16
2013	15.6%	14.4%	13.1–15.7%	7.26	6.60–7.91	5.6%	5.7%	4.5–6.9%	3.10	2.45–3.76	10.1%	9.6%	8.7–10.5%	10.36	9.05–11.67
Binge drinking (60 g or more for one time, alcohol consumed once or more per week)															
2003	10.7%	10.8%	9.4–12.1%	5.36	4.66–5.99	2.1%	2.5%	1.3–3.8%	1.33	0.69–2.02	6.1%	6.2%	5.3–7.1%	6.69	5.35–8.01
2008	8.6%	8.6%	7.7–9.6%	4.34	3.87–4.83	1.4%	1.4%	0.6–2.3%	0.73	0.32–1.24	4.7%	4.5%	3.8–5.1%	5.07	4.19–6.07
2013	11.3%	12.0%	11.0–13.1%	6.07	5.55–6.60	2.0%	2.2%	1.3–3.2%	1.21	0.71–1.74	6.2%	6.4%	5.7–7.2%	7.28	6.26–8.34
CAGE 2 points or more															
2003	6.8%	6.4%	5.4–7.5%	3.19	2.68–3.72	1.2%	1.4%	0.4–2.5%	0.76	0.21–1.33	3.8%	3.8%	3.1–4.6%	3.95	2.89–5.05
2008	5.5%	5.3%	4.5–6.1%	2.67	2.26–3.07	1.5%	1.5%	0.7–2.2%	0.83	0.38–1.19	3.3%	3.3%	2.8–3.8%	3.50	2.64–4.26
2013	5.9%	5.5%	4.7–6.3%	2.79	2.37–3.18	1.1%	1.2%	0.5–1.8%	0.63	0.27–0.98	3.3%	3.2%	2.7–3.7%	3.42	2.64–4.16
KAST 2 points or more															
2003	7.1%	7.4%	6.3–8.5%	3.67	3.12–4.21	1.2%	1.4%	0.3–2.4%	0.72	0.16–1.28	3.9%	4.2%	3.5–5.0%	4.39	3.28–5.49
2008	4.9%	4.6%	3.8–5.3%	2.32	1.91–2.67	1.1%	1.1%	0.4–1.7%	0.57	0.22–0.92	2.8%	2.6%	2.1–3.1%	2.89	2.13–3.59
2013	5.1%	4.9%	4.2–5.7%	2.46	2.12–2.87	0.7%	0.8%	0.2–1.5%	0.45	0.11–0.82	2.7%	2.6%	2.1–3.1%	2.91	2.23–3.69
Heavy episodic drink															
2013	28.4%	30.5%	29.0–32.1%	15.36	14.62–16.18	6.6%	7.2%	5.7–8.6%	3.94	3.10–4.68	16.4%	17.4%	16.3–18.5%	19.30	17.09–19.40

Table 3. Presence or absence of medical institution, physical examination, medical interview, and sobriety guidance in each problem drinking (2013 survey)

	Has experienced alcoholism		Testing	Currently suffering from alcoholism		Testing	AUDIT more than 12 points		Testing	AUDIT more than 15 points		Testing	Risky drinking		Testing
	Present (n = 44)	Not present		Present (n = 23)	Not present		Present (n = 228)	Not present		Present (n = 113)	Not present		Present (n = 393)	Not present	
I want to stop drinking now															
Male	12.8	2.4	<0.01	20.0	2.4	<0.01	2.5	2.6	0.96	4.0	2.5	0.33	0.7	3.0	0.02
Female	20.0	0.9	<0.01	33.3	0.9	<0.01	6.9	0.8	<0.01	14.3	0.8	<0.01	1.0	0.9	0.94
Total	13.6	1.6	<0.01	21.7	1.6	<0.01	3.1	1.6	0.02	5.3	1.6	<0.01	0.8	1.8	0.18
I want to reduce the amount I drink now															
Male	46.2	7.4	<0.01	50.0	7.8	<0.01	27.1	6.0	<0.01	30.3	7.0	<0.01	16.2	6.8	<0.01
Female	40.0	2.4	<0.01	33.3	2.4	<0.01	34.5	2.0	<0.01	35.7	2.2	<0.01	18.6	1.7	<0.01
Total	45.5	4.6	<0.01	47.8	4.8	<0.01	28.1	3.7	<0.01	31.0	4.3	<0.01	16.8	3.8	<0.01
I have received treatment for alcoholism															
Male	15.4	0.0	<0.01	20.0	0.1	<0.01	2.0	0.1	<0.01	3.0	0.2	<0.01	0.3	0.3	1.00
Female	0.0	0.0	–	0.0	0.0	–	0.0	0.0	–	0.0	0.0	–	0.0	0.0	–
Total	13.6	0.0	<0.01	17.4	0.0	<0.01	1.8	0.1	<0.01	2.7	0.1	<0.01	0.3	0.1	1.00
I have visited a medical facility in the past year															
Male	87.2	64.6	<0.01	85.0	64.8	0.07	63.8	65.2	0.79	63.6	65.1	0.88	64.3	65.2	0.45
Female	60.0	69.3	0.97	66.7	69.3	0.86	58.6	69.4	0.60	71.4	69.3	0.35	57.8	69.8	0.09
Total	84.1	67.2	0.36	82.6	67.3	0.39	63.2	67.6	0.60	64.6	67.5	0.39	62.6	67.9	0.08
I have been interviewed about drinking when visiting a medical institution															
Male	71.8	23.0	<0.01	70.0	23.5	<0.01	41.2	22.0	<0.01	44.4	22.9	<0.01	36.1	21.8	<0.01
Female	40.0	10.4	0.02	66.7	10.4	<0.01	27.6	10.3	<0.01	35.7	10.4	<0.01	20.6	10.0	<0.01
Total	68.2	16.0	<0.01	69.6	16.3	<0.01	39.5	15.3	<0.01	43.4	15.8	<0.01	32.1	15.0	<0.01
I have received sobriety advice from a doctor when visiting a medical institution															
Male	51.3	7.8	<0.01	55.0	8.2	<0.01	27.6	6.4	<0.01	30.3	7.5	<0.01	21.6	6.3	<0.01
Female	40.0	1.1	<0.01	66.7	1.1	<0.01	13.8	1.1	<0.01	21.4	1.1	<0.01	5.9	1.0	<0.01
Total	50.0	4.1	<0.01	56.5	4.3	<0.01	25.9	3.3	<0.01	29.2	3.9	<0.01	17.6	3.2	<0.01
I have had a health checkup in the past year															
Male	66.7	75.1	0.26	70.0	75.0	0.63	76.9	74.7	0.52	76.8	74.8	0.69	82.1	73.6	<0.01
Female	60.0	66.5	0.80	66.7	66.5	0.97	62.1	66.6	0.68	35.7	66.7	0.02	65.7	66.5	0.96
Total	65.9	70.3	0.49	69.6	70.3	0.86	75.0	70.0	0.79	71.7	70.2	0.03	77.9	69.5	0.17
I have received sobriety advice at a health checkup															
Male	35.9	8.6	<0.01	55.0	8.7	<0.01	34.7	6.1	<0.01	39.4	7.5	<0.01	26.1	6.0	<0.01
Female	40.0	1.1	<0.01	33.3	1.1	<0.01	10.3	1.1	<0.01	7.1	1.1	<0.01	5.9	1.0	<0.01
Total	36.4	4.4	<0.01	52.2	4.5	<0.01	31.6	3.2	<0.01	35.4	3.9	<0.01	20.9	3.1	<0.01
I have been identified as having liver dysfunction because of drinking															
Male	35.9	7.4	<0.01	45.0	7.6	<0.01	25.6	5.9	<0.01	31.3	6.7	<0.01	15.5	6.7	<0.01
Female	40.0	0.5	<0.01	66.7	0.5	<0.01	3.4	0.5	0.04	7.1	0.5	<0.01	2.9	0.5	<0.01
Total	36.4	3.6	<0.01	47.8	3.7	<0.01	22.8	2.8	<0.01	28.3	3.2	<0.01	12.2	3.1	<0.01
I have had treatment for liver dysfunction															
Male	25.6	3.2	<0.01	35.0	3.3	<0.01	12.1	2.6	<0.01	15.2	3.0	<0.01	5.8	3.2	0.04
Female	40.0	0.3	<0.01	66.7	0.3	<0.01	3.4	0.3	<0.01	7.1	0.3	<0.01	2.9	0.2	<0.01
Total	27.3	1.6	<0.01	39.1	1.6	<0.01	11.0	1.3	<0.01	14.2	1.5	<0.01	5.1	1.5	<0.01

Risky drinking: male ≥ 280 g/w, female ≥ 168 g/w.

Respective proportions: crude proportion, test: Compared based on presence/absence of each drinking problem.

DISCUSSION

This study has revealed the status and trends of drinking among representative Japanese adult samples. This article was the first report that investigated adult alcohol use behavior of Japan using the representative samples periodically. The present study revealed the prevalence of alcohol use disorders among Japanese adults according to various criteria including suspected alcohol dependence measured by the criterion of ICD-10 and alcohol use disorders measured by AUDIT. The study also reported the estimated number of people with alcohol use disorders according to various criteria. These values and secular trends are the first reports from Japan. These show the seriousness of the alcohol-related problem in Japan.

Although the proportion of drinkers is higher among men than women, the proportion of daily drinkers and alcohol consumption per week, as well as average AUDIT scores, etc., show a declining tendency in men. Such decreasing trend in women was not observed. In addition, the average ages for first drink and first drunken experience were shown to be younger in only the female population. As well, the age of the start of habitual drinking is becoming younger for both men and women.

The response rate in the 2003 survey was higher than other surveys, an attention for the interpretation of these results is necessary. However, its impact is considered to be limited because significant differences of descriptive epidemiologic features were not observed between respondents and non-respondents in every survey. Thus, since the drinking rates among men appear to be on a decreasing trend, drinking rates among men and women are becoming closer. The drinking behavior is starting at a younger age, so regular monitoring into the future is necessary.

The proportion of the adult Japanese population suspected of alcoholism is low in comparison with survey results in the United States and European countries. While the survey of the US general population shows that 5–10% were found to be suffering from alcoholism according to ICD-10 criteria (Grant, 1990; Caetano and Tam, 1995), this survey of the general Japanese population found a rate of around 1%. Comparing the results of surveys in European countries concerning drinking frequency and amount using AUDIT criteria, Japanese men and women showed lower scores (Knibbe *et al.*, 2006). However, the frequency of heavy episodic drinking was almost the same in men, and was not particularly lower in women. Even considering that 40% of Japanese people are not inclined to drink alcohol because of a flushing reaction (genotype that cannot metabolize ethanol), these prevalence of alcohol use disorders are still low in Japan. One of the reasons for this is that the proportion of female problem drinkers in Japan is very low compared to other developed countries. For example, the frequency of alcoholism measured by ICD-10 criteria is high in Europe, and has risen to 11% in Finnish women, whereas in Japan the number was very small (Poikolainen, 1997). Furthermore, the average AUDIT scores of Japanese women and the number of Japanese women obtaining high AUDIT scores were very low when compared to Australian women (Fleming, 1996).

On the other hand, when compared with the results of rising or developing countries, the number of Japanese men showing high AUDIT scores and the total amount of alcohol consumed were larger than the results in Thailand. The proportion of Japanese women with high scores was not significantly different. However the amount of alcohol consumed was higher than that of Thai women (Assanangkornchai *et al.*, 2010). When compared with Brazil, the proportion of heavy drinkers in Japan was lower in both men and women (Silveira *et al.*, 2012).

However, the proportion of people in Japan suspected of alcoholism or with drinking problems indicates there are a large number of people in this category. For example, the 2013 survey results indicate that an estimated 1.07 million people suffer from alcoholism, 5.93 million people have an AUDIT score of 12 points or more, 2.92 million people have an AUDIT score of 15 points or more, and 9.74 million people are engaged in risky drinking behavior.

This survey is significant in the sense that it has measured and estimated the frequency of alcoholism in the general population using multiple indicators, something that no national survey has conducted before (Kono *et al.*, 1985; Cabinet Office, 1989; Higuchi and Kono, 1996; Japan Health Promotion & Fitness Foundation, 1997). The current screening survey used the following criteria, listed in ascending order of the proportion of people who tested positive (suspicion of alcoholism): 2 CAGE points or more, 15 AUDIT points or more, 2 KAST points or more, and 'alcoholic' determined by ICD-10.

The trends from the 2003 survey point to a decline in the percentages and estimates for people with 15 or more AUDIT points, 2 or more CAGE points, and 2 or more KAST points, whereas there is no clear increase or decrease in the number of people determined to be alcoholics by ICD-10, or who have obtained 20 or more AUDIT points. In addition, the percentages and estimates of risky drinking, hazardous drinking, and binge drinking were lower in 2008 than 2003, but rose again in 2013. The survey conducted in 2013 measured the percentages of heavy episodic drinking among men and women for the first time, and found a high rate of 17.4% (corresponding to an estimated 19.3 million people). This drinking behavior occurs especially in young drinkers. There is a need to continue to carefully observe the drinking behavior of different generations into the future.

The 2013 survey looked at the subjects' desire for abstinence or reduction of their alcohol consumption, and guide of moderation in drinking at a medical institution or during a health examination. The proportion of people who are alcoholics or problem drinkers and wish to reduce their consumption of alcohol was high, and as a person with a heavier alcohol use disorder, the proportions were high. However, the proportion of person who wanted to abstain from alcohol was low in the persons except alcoholism.

The proportion of people who visit medical institutions was higher in people with alcohol use disorders than those who were not, and the proportion of those who had health examination also remained high. However, the proportion of those who received a medical interview regarding alcohol use was lower among women, with many problem drinkers not receiving a medical interview, meaning they did not receive much advice on how to cut down their drinking by medical professionals. This trend was even more pronounced for health examinations; many women with drinking problems did not receive advice on how to cut down their drinking.

More than 90% of people suffering from alcoholism or drinking problems were not receiving appropriate medical treatment. In addition, many people suffering from impairment of liver function were also not receiving treatment. This trend has also been reported in Europe and the United States, and many alcoholics are not receiving adequate treatment (Cohen *et al.*, 2007; Chartier and Caetano, 2011). The current study suggests that the proportion of Japanese alcoholics who are receiving adequate treatment may be even lower than that in Europe and the USA (Cunningham and Breslin, 2004; Kaufmann and Chen, 2014).

Alcoholism, when compared with other kinds of substance dependence, may be the addiction that people are least willing to stop (Wong, 2013), thus making treatment exceedingly difficult. However, this study has revealed that there are a certain percentage of alcoholics

who wish to stop or reduce their drinking. In addition, an unexpectedly high percentage of people with drinking problems have visited medical institutions or had health examinations, thus these places have the potential to be an important place for providing moderation in drinking guidance in Japan. It became clear that moderation in drinking is not taking advantage of this potential at present. In other words, medical professionals do not recognize problem drinkers in front of them, therefore missing an opportunity for intervention. In the future, it is important that pre-alcoholics are screened and offered an appropriate treatment and moderation in drinking guidance at a medical institution or during a health examination. However, a problem of cost-effectiveness can occur if the frequency of intervention at general medical institutions or during health checkups is low, so the health economic considerations will be also necessary in the future (Desai *et al.*, 2005).

Limitations

This survey experienced a higher rate of respondents in 2003 than in 2008 or 2013, which is a problem when considering trends. In terms of socioeconomic indicators such as the average number of years of education, the proportion of people in regular employment, and household incomes, no major differences were observed between the respondents to this study and to national surveys (Human Development Planning Report 2014, Ministry of Health, Labor and Welfare Labor Force Survey, Ministry of Health, Labor and Welfare Livelihood Survey). Furthermore, although these indicators have showed differences according to the study year, these differences are believed to have been caused by social change, and are therefore reasonable to expect. Considering that the 2003 survey results were not wildly different from the 2008 and 2013 surveys, it is likely that there is no major bias in respondents in the 2008 and 2013 surveys even though their response rates were low.

ACKNOWLEDGEMENTS

We would like to appreciate to Lundbeck Japan K. K for English translation of this article.

FUNDING

This work was supported by 'Health and Labour Sciences Research Grants' Comprehensive Research on Life-Style Related Diseases including Cardiovascular Diseases and Diabetes Mellitus [2013 to 2015 Cardiovascular, etc. (Lifestyle) – General - 011; Ministry of Health, Labour and Welfare].

CONFLICT OF INTEREST STATEMENT

None declared.

REFERENCES

Allen JP, Litten RZ, Fertig JB, *et al.* (1997) A review of research on the alcohol use disorders identification test (AUDIT). *Alcohol Clin Exp Res* 21:613–9.

Assanangkornchai S, Sam-Angsri N, Rempongpan S, *et al.* (2010) Patterns of alcohol consumption in the Thai population: results of the national household survey of 2007. *Alcohol Alcohol* 45:278–85.

Barry K, Fleming MF. (1993) The alcohol use disorders identification test (AUDIT) and the SMAST-13: Predictive validity in a rural primary care sample. *Alcohol Alcohol* 28:33–42.

Cabinet Office. (1989) Alcohol use by Japanese. In Public Relations Office, Cabinet Office (eds). *Alcohol and Tobacco in Japan*. Tokyo: Printing Office, Ministry of Finance, 2–55.

Caetano R, Tam TW. (1995) Prevalence and correlates of DSM-IV and ICD-10 alcohol dependence: 1990 US National Alcohol Survey. *Alcohol Alcohol* 30:177–86.

Chartier KG, Caetano R. (2011) Trends in alcohol services utilization from 1991–1992 to 2001–2002: ethnic group differences in the U.S. population. *Alcohol Clin Exp Res* 35:1485–97.

Cohen E, Feinn R, Arias A, *et al.* (2007) Alcohol treatment utilization: findings from the national epidemiologic survey on alcohol and related conditions. *Drug Alcohol Depend* 86:214–21.

Cunningham JA, Breslin FC. (2004) Only one in three people with alcohol abuse or dependence ever seek treatment. *Addict Behav* 29:221–3.

Department of Mental Health and Substance Dependence, World Health Organization. (2000) *International Guide for Monitoring Alcohol Consumption and Related Harm*. Geneva: World Health Organization.

Desai MM, Rosenheck RA, Craig TJ. (2005) Screening for alcohol use disorders among medical outpatients: the influence of individual and facility characteristics. *Am J Psychiatry* 162:1521–6.

Fleming J. (1996) The epidemiology of alcohol use in Australian women: findings from a national survey of women's drinking. *Addiction* 91:1325–34.

Grant BF. (1990) ICD-10 harmful use of alcohol and the alcohol dependence syndrome: prevalence and implications. *Addiction* 88:413–20.

Health Science Council, Community Health, Health Promotion and Nutrition Group, Ministry of Health, Labor and Welfare. (2012) *Healthy Japan 21 (2nd Plan)*. Reference Materials Related to Promotion [in Japanese]. http://www.mhlw.go.jp/bunya/kenkou/dl/kenkounippon21_02.pdf (11 September 2015, date last accessed).

Healthy Japan 21 evaluation work team, Ministry of Health, Labor and Welfare. (2011) Healthy Japan 21 final evaluation [in Japanese]. <http://www.mhlw.go.jp/stf/houdou/2r985200001r5gc-att/2r985200001r5np.pdf> (11 September 2015, date last accessed).

Higuchi S, Kono H. (1996) Views of drinking behavior and drinking among Japanese—looking back on US-Japan joint research. In Higuchi S (ed.). *On the Front Line of Clinical Alcohol Research*. Tokyo: Health and Welfare Publications, 1–44.

Hiro H, Shima S. (1996) A study on the usefulness of problem drinking indicators AUDIT (Japanese Version). *Nihon Arukoru Yakubutsu Igakkai Zasshi* 31:437–50.

Japan Health Promotion & Fitness Foundation. (1997) Smoking and alcohol drinking. In Japan Health Promotion & Fitness Foundation (eds). *Health Awareness Survey*. Tokyo: Japan Health Promotion & Fitness Foundation, 89–92.

Kaufmann CN, Chen LY. (2014) Treatment seeking and barriers to treatment for alcohol use in persons with alcohol use disorders and comorbid mood or anxiety disorders. *Soc Psychiatry Psychiatr Epidemiol* 49:1489–99.

Knibbe RA, Derickx M, Kuntsche S, *et al.* (2006) A comparison of the alcohol use disorder identification test (AUDIT) in general population surveys in nine European countries. *Alcohol Alcohol* 41(Suppl 1):i19–25.

Kono H, Kato M, Ogata M, *et al.* (1985) Survey on Drinking Patterns and Health. In Ministry of Health and Welfare, Mental Health Division (eds). *Japan-US Science and Technology Report, Alcohol Addiction Research Report*. Tokyo: Environmental Issues and Welfare Study Group, 72–194.

Mayfield D, Mcleod G, Hall P. (1974) The CAGE questionnaire: validation of a new alcoholism screening instrument. *Am J Psychiatry* 131:1121–3.

Osaki Y, Matsushita S, Shirasaka T, *et al.* (2004) National nutrition survey, percentage of adult drinkers in Japan, estimated percentage of heavy drinkers [in Japanese]. *Kosei no Shihyo* 51:22–6.

Osaki Y, Matsushita S, Shirasaka T, *et al.* (2005) Nationwide survey of alcohol drinking and alcoholism among Japanese adults [in Japanese]. *Jpn J Alcohol Drug Depend* 40:455–70.

Poikolainen K. (1997) Risk factors for alcohol dependence: a questionnaire survey. *Alcohol Clin Exp Res* 21:957–61.

Saito S, Ikegami N. (1978) KAST (Kurihama Alcoholism Screening Test) and its applications. *Nihon Arukoru Yakubutsu Igakkai Zasshi* 13:229–37.

- Silveira CM, Siu ER, Wang YP, *et al.* (2012) Gender differences in drinking patterns and alcohol-related problems in a community sample in Sao Paulo, Brazil. *Clinics* 67:205–12.
- Wong M. (2013) Age of onset of alcohol and other substance as typology of alcohol dependence in the NESARC sample. *Alcohol Clin Exp Res* 37 (Suppl 2):268A.
- World Health Organization. (1992) *The ICD-10 Classification of Mental and Behavioural Disorders, Clinical Descriptions and Diagnostic Guidelines*. Geneva: World Health Organization.
- World Health Organization. (2009) *Global Health Risks: Mortality and Burden of Disease Attributable to Selected Major Risks*. Geneva: World Health Organization.
- World Health Organization. (2010a) *Global Strategy to Reduce Harmful Use of Alcohol*. Geneva: World Health Organization.
- World Health Organization. (2010b) Governments confront drunken violence. *Bull World Health Organ* 88:644–5.
- World Health Organization. (2014) *Global Status Report on Alcohol and Health 2014*. Geneva: World Health Organization.