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減酒支援の効果判定のための無作為化比較試験

ORIGINAL ARTICLE

ALCOHOLISM CLINICAL & EXPERIMENTAL RESEARCH

Effectiveness of nurse-delivered screening and brief alcohol intervention in the workplace: A randomized controlled trial at five Japan-based companies

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Abstract

Background: Excessive alcohol use is a leading cause of global morbidity and premature mortality. This study evaluated the effectiveness of two types of nurse-delivered interventions to reduce excessive alcohol consumption among screened participants using the alcohol use disorders identification test (AUDIT) in the workplace.

Methods: A randomized controlled trial involving AUDIT-positive employees of five Japan-based companies was conducted. A total of 351 participants were randomized into groups that received a patient information leaflet (PIL), 5 min of brief advice, or 15 min of brief advice and counseling. Outcomes (weekly alcohol consumption and drinking and binge drinking frequency in the previous 30 days) were evaluated at 6 and 12-month follow-up.

Results: The follow-up rates were 96.3% (n = 338) and 94.9% (n = 333) at 6 and 12 months, respectively. At 6 months, the mean change in weekly alcohol consumption was −38.1 g (−1.64 US fluid oz/week) in the 15-min brief advice and counseling group, which differed significantly from the PIL group. The reduction in the advice and counseling group persisted at 12-month follow-up but was no longer significantly different from the PIL group. There was no significant change in alcohol consumption observed in the 5-min brief advice group. Improvement in drinking and binge drinking frequency was observed in all three groups.

Conclusions: Nurse-delivered 15-min brief advice and counseling was effective over a 6-month period in reducing alcohol consumption in a workplace setting. This finding suggests that the implementation of workplace screening and brief intervention could play a useful role in preventing the burden of harmful alcohol use.

KEYWORDS
brief intervention, excessive alcohol drinking, prevention, workplace

INTRODUCTION

Excessive alcohol use is a leading cause of global morbidity and premature mortality. It is also associated with violence, injury risk, various social harms, and substantial economic losses (Rekve et al., 2019; World Health Organization, 2018). According to a World Health Organization (2018) estimate, 5.1% of adults had an alcohol use disorder. A study found that 20%–30% of patients who routinely receive primary care are hazardous or harmful drinkers (Funk et al., 2005). In a Japanese study utilizing a nationally representative sample, 23.6% of men and 3.3% of women were hazardous drinkers (Higuchi et al., 2007).

Several meta-analyses have shown that screening using short questionnaires followed by brief advice and counseling significantly reduces alcohol consumption in primary care settings (Ballesteros et al., 2004; Bertholet et al., 2005; Kaner et al., 2018; Moyer et al., 2002; Whitlock et al., 2004). Therefore, facilitating screening and brief intervention (SBI) is a vital strategy to reduce the harmful effects of alcohol consumption (Rekve et al., 2019). Providing such interventions across various settings can contribute to this strategy. A meta-analysis of seven trials in the workplace reported that SBI reduced alcohol consumption by 22.5 g per week (95% confidence interval [CI]: 3 to 42 g) compared with controls (Yuvaraj et al., 2019). A systematic review by Charlet and Heinz (2017) described that reducing alcohol consumption led to benefits in physical, mental, and societal health and life quality. However, further trials are needed to gather more evidence. First, a Cochrane Collaboration systematic review reported no significant additional benefit of extended or repetitive interventions compared with brief intervention (approximately 20 min) (Kaner et al., 2018). If a short (5-min) intervention or single-point intervention shows sufficient effect, there may be certain advantages in the implementation of SBI under time constraints in daily clinical practice. Second, although studies have indicated that the occupational healthcare system in Japan makes the workplace an important site for SBI, results regarding effectiveness have been inconsistent (Araki et al., 2006; Harada et al., 2015; Ito et al., 2015; Iyadomi et al., 2013). Lack of initial screening may lead to the failure to intervene in the target population adequately. Third, existing meta-analyses are based predominantly on trials conducted in Western countries. Evidence of SBI in Asian countries is of value for further investigation. Moreover, considering cost and versatility, SBI provided by nurses is preferable for broader implementation in the workplace than that provided by physicians. Accordingly, a report by the Japanese Nursing Association in 2019 stated that 8156 (0.48%) of 1,683,245 nurses were employed in the domain of industrial healthcare. However, only 1231 (0.38%) of 327,210 doctors were exclusively engaged in occupational healthcare, as reported by the Ministry of Health, Labour, and Welfare in 2018.

In this context, this trial aimed to evaluate the effectiveness of two types of nurse-delivered single-point interventions to reduce excessive alcohol consumption for participants screened through the alcohol use disorders identification test (AUDIT) (Saunders et al., 1993) in a workplace setting. We hypothesized that single-point standard brief alcohol intervention (15-min brief advice and counseling) delivered by a nurse was effectively reduced alcohol consumption. Moreover, we hypothesized that the effectiveness of the single-point nurse-delivered short intervention was comparable with the standard intervention.

MATERIALS AND METHODS

Trial design

The details of this trial protocol have been published previously (Kuwabara et al., 2021). The study design consisted of three parallel groups with a 1:1:1 allocation. Fieldwork was conducted at five companies in Japan from January 2019 to December 2020.

Setting and eligibility criteria

Setting

A total of 2314 employees from five companies in two western Japanese regions were the recruitment target for this study. The number of employees was 35, 165, 469, 735, and 910, respectively. Four were manufacturing offices, and another was a local municipal office. The occupational health doctors and nurses were assigned to four of these companies.

Inclusion and exclusion criteria

Employees were eligible for inclusion in this study if they were aged 20 years or older and had AUDIT scores ≥8 points (Saunders et al., 1993; World Health Organization, 2001). Age 20 is the minimum legal drinking age in Japan. Employees were excluded if they were aged ≥75 years, were involved in an alcohol treatment program in the previous year, reported symptoms of alcohol withdrawal in the last 12 months, received physician advice to change their pattern of alcohol consumption in the previous 3 months, were pregnant, or reported suicidal tendencies.

Training and brief intervention manual

External health professionals with nursing qualifications conducted the brief interventions. Before the study, each participating nurse received training in alcohol SBI. The training program consisted of e-learning and role-playing using an SBI manual explicitly developed for this study. The training covered basic details about the AUDIT program and relevant techniques and tips for advising individuals with alcohol-related problems (Saitz, 2010). Training material included the stages of change model (DiClemente et al., 1999) and motivational interviewing techniques (Hettema

et al., 2005). The aim of including motivational interviewing in our training program was to make the trainers aware of delivering the session, boosting the participant's motivation to change their behavior. Thus, our intervention aimed to deliver a brief motivational intervention using our original worksheet rather than providing simple advice. After training, the participating nurses were given the opportunity to observe an actual brief alcohol intervention implemented by well-trained physicians.

Randomization and blinding

Each participant was assigned to a unit of randomization. Unrestricted, simple randomization was used. Participants who met the inclusion criteria were enrolled and randomly allocated into three groups by the researchers using a computer-generated allocation method. The intervenient was informed of the group allocation of each participant by letter. This study did not involve blinding of the participants owing to the nature of the intervention. Nevertheless, blinding for outcome assessment was performed for researchers as alcohol consumption was calculated mechanically.

Interventions

Our trial aimed to examine whether the standard brief alcohol intervention (15-min brief advice and counseling) was effective in reducing alcohol consumption. Moreover, we aimed to investigate the effectiveness of short interventions. Therefore, we set up three groups: the patient information leaflet (PIL) group, the brief advice and counseling group, and the 5-min brief advice group.

Participants were randomly assigned to one of the three groups, and the external health professionals were randomly allocated as in charge of different groups of the company's employees. The interventions were provided at the time of recruitment at their workplaces.

PIL

Participants in the control group completed a baseline questionnaire and provided their AUDIT scores with a PIL. The PIL used in this trial was adapted from the Kurihama National Hospital's (2019) leaflet.

Brief advice and counseling

Participants in the brief advice and counseling group completed the baseline questionnaire and received a 15-min face-to-face SBI session, including a one-on-one interview with a trained health staff member and an original worksheet. The sessions aimed to ensure that the participants completed six tasks on a worksheet. The worksheet was based on the principles of cognitive-behavioral therapy and included an AUDIT evaluation, feedback on results, a balance sheet for considering the advantages and disadvantages of drinking, drinking-related goal setting, and a list of coping methods for dealing with risky situations associated with binge drinking. Appendix S1 shows the specific procedure of our brief advice and counseling. First, the participants were asked to consider the advantages and disadvantages of drinking alcohol. Second, based on the epidemiological data in Japan, we made participants aware of their alcohol consumption compared with the general population. Similarly, the results of their medical examination were explained. Fourth, we asked them to recall the situations where they consumed excessive alcohol. Fifth, the participants set an achievable goal and declared it. Sixth, the participants were asked to choose a method of achieving their goals. Explaining the results of a medical examination might be a specific adaptation in the workplace in Japan. We could obtain the information as employers are legally obligated to provide an annual medical health checkup to all employees.

Five-minute brief advice

Participants in the 5-min brief advice group completed the baseline questionnaire and received up to 5 min of a simple, structured face-to-face brief intervention from a trained professional (Babor et al., 1996; Cunningham et al., 2012). The worksheet used with the brief advice and counseling group was also used with the 5-min group. The SBI session aimed to complete three tasks on the worksheet: AUDIT evaluation, feedback on results, and drinking-related goal setting.

Procedure

The worksheets and leaflets were available on our university website (Tottori University, n.d.). Every participant was requested to use the original smartphone application containing a drinking diary. However, the online trace showed that only a few participants used the drinking diary. Therefore, we did not use the diary for outcome measures.

Each participant received a JPY 1000 (USD 10) voucher from the interviewer after completing the baseline questionnaire. Another JPY 1000 voucher was posted after the completion of the 6 and 12-month follow-up questionnaires.

Outcome evaluation

The primary outcome was a change in weekly alcohol consumption (grams of pure alcohol per week) 6 months after the intervention. At baseline, 6 (±1) months, and 12 (±1) months, we assessed the frequency of alcohol consumption, binge drinking in the previous 30 days, and the amount of alcohol consumed. These three questions

were similar to those used in the AUDIT-C (Dawson et al., 2005). We assessed the participants' alcohol consumption twice per person by sending a self-administered questionnaire to each company 6 and 12 months after the intervention. The occupational health staff at the company distributed the questionnaire to the study participants in the company and collected the questionnaires. Subsequently, the occupational health staff sent back the questionnaires to the research office. The research team calculated the participants' weekly alcohol consumption by assessing the frequency of alcohol use and the type and amount of alcohol consumed on a daily and monthly basis. Binge drinking was defined as consuming >60 g of pure alcohol per occasion (World Health Organization, n.d.). Secondary outcome measures were changed in weekly alcohol consumption 12 months after the intervention and frequency of drinking and binge drinking in the previous 30 days.

Sample size calculation

The sample size was calculated to account for participant-level outcomes. The change in weekly alcohol consumption at 6 months was the primary outcome of interest. Based on a previous study (Fleming et al., 1997), we expected a 40 g/week consumption reduction in the brief intervention group compared with the control group and a standard deviation of 7-day alcohol use (100 g/week) (Fleming et al., 1997). Given the 5% significance level and 80% statistical power of a two-sided test, the number of participants per group was 100, yielding a total sample of 300. Our experience with other trials of SBI at workplaces suggests a potential 10% loss at follow-up across groups, resulting in a final sample of 110 participants per group (a total of 330).

Statistical analysis

The planned analysis was by intention to treat. The primary outcome (changes in weekly alcohol consumption) was continuous and analyzed using a one-way analysis of variance (ANOVA). Dunnett's tests were used to determine the differences between the intervention and control groups in the case of statistical significance being detected using ANOVA. Chronological changes in alcohol consumption and AUDIT-C score within each group from baseline were examined using paired *t*-tests. Similarly, chronological changes in the frequency of drinking more than 5 days a week and binge drinking in the previous 30 days within each group were examined using McNemar's tests. In addition, we conducted a sensitivity analysis assuming that drinking behavior (weekly alcohol consumption and frequency of drinking or binge drinking) among those who withdrew during the follow-up period did not change from baseline. Moreover, we analyzed the data of participants followed up for 6 months. Considering the robustness of statistical analysis and the possibility of incomplete randomization, we conducted the additional analysis using generalized linear mixed-effects models. For the mixed models, we designed the participants as a random effect, while the allocated group, sex, age, and weekly alcohol consumption at baseline were treated as fixed effects. Data analyses were performed using SPSS 25.0 (IBM Corp) and STATA version 16 (Stata Corp LP).

Ethical considerations

The trial protocol was reviewed and approved by the Ethics Review Committee of the Faculty of Medicine, Tottori University, at the time of the survey (reference number 18B002). This trial was registered in the University Hospital Medical Information Network (UMIN) Clinical Trials Registry (UMIN-CTR (UMIN); unique ID UMIN000036244), n.d.. In addition, research governance approval was granted by the Ministry of Health and Welfare Health Science Research Fund in Japan (grant number 29060801).

Consent for participation was obtained via a two-stage process. Staff from the occupational health department at each site screened employees for eligibility. No identifiable information was collected at this stage. Employees who met the inclusion criteria received information regarding the study from the research team. Written informed consent was obtained at this stage, including permission to allow the research staff to access personal and contact details and routine health check-up records. The participants agreed to be followed up after 6 and 12 months. After providing consent, participants completed the baseline questionnaire. Once the external staff confirmed the questionnaire's completion, the participants received their allocated intervention. These interventions were conducted privately in a meeting room of each company. Other employees in the company were unaware that the participants received the alcohol-related intervention, ensuring the privacy and confidentiality of the participation. No employers had access to the research data. They knew neither who was enrolled in an alcohol intervention study nor what their AUDIT scores were.

RESULTS

Participant flow and follow-up

Of the 2276 employees who completed the AUDIT questionnaire, 505 (22.1%) were identified as hazardous or harmful drinkers. Overall, 380 patients were eligible and allocated to three groups; 351 (92.4%) consented to participate in the trial. Consent rates were similar between the groups (Figure 1).

At 6 months, the follow-up rate was 96.3% (PIL 95.5% [$n = 106$], brief advice and counseling 96.1% [$n = 123$], 5-min brief advice 97.3% [$n = 109$]) and at 12 months, 94.9% (PIL 92.8% [$n = 103$], brief advice and counseling 95.3% [$n = 122$], 5-min brief advice 96.4% [$n = 108$]). Follow-up rates did not differ significantly between the interventions.

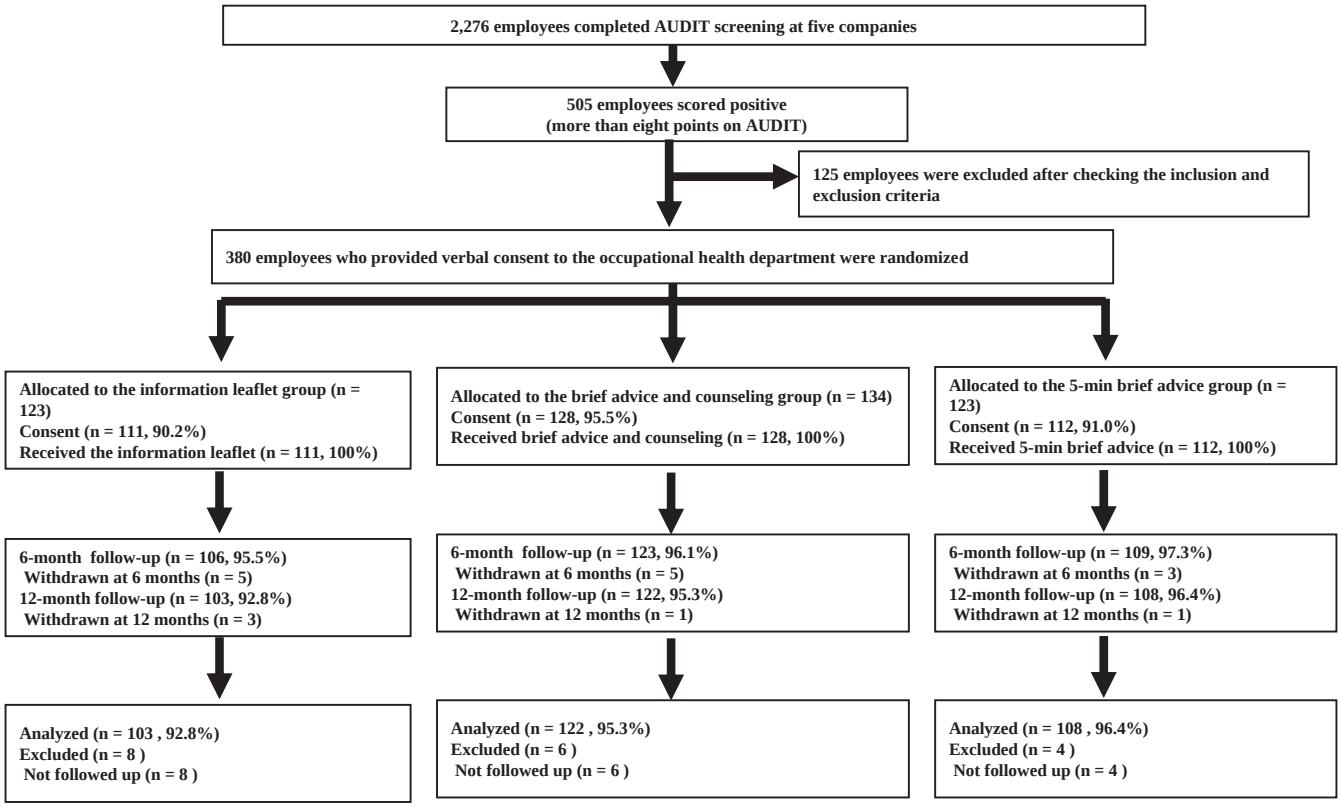

FIGURE 1 The flow of participants through the trial

Baseline data

The data of 351 participants were analyzed, and their characteristics were reported in the paper we published (Kuwabara et al., 2021). A total of 98.3% of participants were men, with a median (interquartile range [IQR]) age of 49 (42 to 55) years. The median (IQR) AUDIT score and weekly alcohol consumption were 11 (9 to 15) points and 238 (121, 392) g/week (10.3 [5.2, 16.9] US fl.oz./week), respectively. The proportion of participants who drank more than 3 days per week, binge drank in the previous 30 days, and currently smoked were 84.9%, 73.5%, and 39.3%, respectively. No significant differences were observed between the groups in any baseline variables, except for marital status.

Primary outcome

A total of 333 participants were analyzed for primary outcome evaluation. The amount of alcohol consumed per week (g/week) significantly decreased at 6 months in the brief advice and counseling group compared with baseline (Table 1). The mean change in alcohol consumption was −38.1 g/week (−1.64 US fl.oz./week) in the 15-minute brief advice and counseling group, and the reduction was significantly different relative to the PIL group. However, a decrease in alcohol consumption was not observed in the 5-min brief advice group. Figure 2 demonstrates the changes in the mean of weekly alcohol consumption in each group. A sensitivity analysis examined whether the loss of follow-up affected our results (Tables 2 and 3). The primary outcome in the brief advice and counseling group was not affected when we assumed that alcohol consumption among those who withdrew during the follow-up period did not change from baseline (Table 2). Likewise, a significant decrease in alcohol consumption was observed compared with baseline in the analysis of participants available for follow-up at 6 months (Table 3). The reduction was significantly different relative to the PIL group.

Secondary outcomes

Alcohol consumption (g/week) decreased at 12 months in the brief advice and counseling group from baseline; however, the change was not statistically significant compared with the control group (Table 1). At 6 months, the proportion of the frequency of drinking more than 5 days per week decreased chronologically in the brief advice and counseling and 5-min brief advice groups. Within all three groups, the proportion of the frequency of drinking more than 5 days per week in 12 months decreased relative to baseline. Among all the participants, the change in frequency from baseline to 12 months was statistically significant. For binge drinking in the previous 30 days, the percentage change from baseline to 6 months was the most significant in the brief advice and counseling group (−16.8%), and the change was statistically significant. At 12 months, the proportion of binge drinking in the previous 30 days significantly decreased from baseline within all

TABLE 1 Alcohol consumption at baseline and follow-up by treatment status ($n = 333$: Participants who completed the follow-up both at 6 and 12 months).

	All participants ($n = 333$)		Information leaflet ($n = 103$)		Brief advice/counseling ($n = 122$)		5-min brief advice ($n = 108$)	
	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value
Weekly alcohol consumption (g/week)								
Baseline	269.2 (189.0)	Ref	258.1 (192.7)	Ref	291.9 (211.7)	Ref	254.0 (154.5)	Ref
6 months	262.5 (187.1)	0.464[a]	272.2 (211.1)	0.423[a]	253.9 (176.8)	0.017[a]	263.1 (175.1)	0.492[a]
12 months	257.9 (205.0)	0.270[a]	249.5 (191.9)	0.579[a]	261.0 (226.8)	0.130[a]	262.5 (192.3)	0.580[a]
% change								
Baseline to 6 months	−2.5		5.5		−13.0		3.6	
Baseline to 12 months	−4.2		−3.3		−10.6		3.4	
Changes in alcohol consumption (g/week)								
Baseline to 6 months	−6.6 (165.3)	NA	14.1 (177.7)	Ref	−38.1 (173.6)	0.034[b]	9.1 (137.0)	0.964[b]
Baseline to 12 months	−11.2 (185.3)	NA	−8.6 (156.9)	Ref	−30.9 (224.2)	0.566[b]	8.5 (159.3)	0.722[b]
	n (%)	*p*-Value	*n* (%)	*p*-Value	*n* (%)	*p*-Value	*n* (%)	*p*-Value
Frequency of drinking >5 days/week								
Baseline	238 (71.5)	Ref	71 (68.9)	Ref	87 (71.3)	Ref	80 (74.1)	Ref
6 months	226 (67.9)	0.052[c]	71 (68.9)	1.00[c]	81 (66.4)	0.146[c]	74 (68.5)	0.146[c]
12 months	222 (66.7)	0.027[c]	64 (62.1)	0.092[c]	80 (65.6)	0.143[c]	78 (72.2)	0.804[c]
% change								
Baseline to 6 months	−5.0		0.0		−6.9		−7.5	
Baseline to 12 months	−6.7		−9.9		−8.0		−2.5	
Binge drinking in the previous 30 days								
Baseline	243 (73.0)	Ref	73 (70.9)	Ref	95 (77.9)	Ref	75 (69.4)	Ref
6 months	219 (65.8)	0.012[c]	71 (68.9)	0.832[c]	79 (64.8)	0.010[c]	69 (63.9)	0.345[c]
12 months	197 (59.2)	0.000[c]	57 (55.3)	0.012[c]	76 (62.3)	0.002[c]	64 (59.3)	0.043[c]
% change								
Baseline to 6 months	−9.9		−2.7		−16.8		−8.0	
Baseline to 12 months	−18.9		−21.9		−20.0		−14.7	
	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value
AUDIT-C total score (0 to 12 points)								
Baseline	7.4 (2.5)	Ref	7.3 (2.5)	Ref	7.6 (2.7)	Ref	7.1 (2.2)	Ref
6 months	7.0 (2.6)	0.007[a]	7.1 (2.6)	0.246[a]	6.9 (2.6)	0.003[a]	7.1 (2.5)	0.892[a]
12 months	6.8 (2.8)	0.000[a]	6.6 (2.9)	0.008[a]	6.9 (2.9)	0.004[a]	6.8 (2.6)	0.180[a]
AUDIT-C score: frequency of drinking (0 to 4 points)								
Baseline	3.5 (0.8)	Ref	3.5 (0.8)	Ref	3.5 (0.8)	Ref	3.6 (0.7)	Ref
6 months	3.5 (0.8)	0.031[a]	3.5 (0.9)	0.640[a]	3.5 (0.9)	0.114[a]	3.5 (0.8)	0.131[a]
12 months	3.5 (0.9)	0.008[a]	3.3 (0.9)	0.038[a]	3.5 (0.9)	0.131[a]	3.5 (0.9)	0.287[a]
AUDIT-C score: the amount of drinking (0 to 4 points)								
Baseline	1.5 (1.3)	Ref	1.6 (1.3)	Ref	1.6 (1.3)	Ref	1.4 (1.1)	Ref
6 months	1.4 (1.2)	0.043[a]	1.5 (1.2)	0.181[a]	1.4 (1.2)	0.020[a]	1.4 (1.2)	0.737[a]
12 months	1.4 (1.2)	0.012[a]	1.4 (1.2)	0.070[a]	1.4 (1.3)	0.033[a]	1.3 (1.1)	0.805[a]
AUDIT-C score: frequency of binge drinking (0 to 4 points)								
Baseline	2.3 (1.3)	Ref	2.2 (1.4)	Ref	2.4 (1.3)	Ref	2.2 (1.2)	Ref
6 months	2.1 (1.3)	0.035[a]	2.1 (1.3)	0.491[a]	2.1 (1.4)	0.008[a]	2.2 (1.3)	0.933[a]
12 months	2.0 (1.4)	0.000[a]	1.9 (1.5)	0.014[a]	2.1 (1.5)	0.004[a]	1.9 (1.4)	0.109[ay]

[a]P-values are derived from paired t-tests within each group unless otherwise indicated.

[b]One-way analysis of variance across the three groups. Post hoc Dunnett's test for comparisons with the patient information leaflet group.

[c]P values are derived from McNemar's tests for paired proportions within each group, unless otherwise indicated.

[d]Binge drinking is defined as having more than 60 g of undiluted alcohol on one occasion.

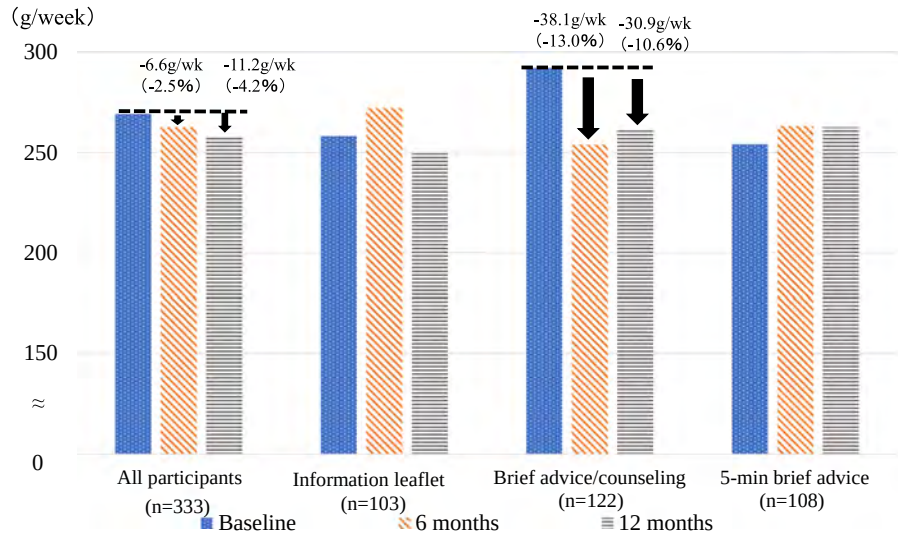

FIGURE 2 Changes in the mean of weekly alcohol consumption in each group over time

groups. Moreover, we observed the chronological changes in the AUDIT-C score. Among all participants, a chronological decrease in AUDIT-C total score was observed (Tables 1 to 3). The total score significantly decreased from baseline to 6 months in the 15-min brief advice and counseling group, but the chronological change was not significant in the 5-min brief advice groups and the control group. Meanwhile, the AUDIT-C total score at 12 months was significantly decreased in the 15-min brief advice and counseling group and the control group. Tables 4 and 5 show the results of generalized linear mixed-effects models. After adjusting for selected fixed effects and random effects, the changes in weekly alcohol consumption at 6 months were significantly different from the control group. In contrast, no significant difference was observed in the changes in weekly alcohol consumption at 12 months compared with the control group. There were no significant differences between the 5-min brief advice groups and the control group at 6 and 12 months. No critical harms or unintended effects were reported in any of the groups. The results of additional generalized linear mixed-effects models were shown in Tables S1 and S2. In addition, we provided supplementary tables and figures which show alcohol consumption in US fluid oz. (Figure S1 and Tables S3-S7).

DISCUSSION

This study is the first randomized controlled trial in Japan to evaluate the effectiveness of SBI combined with AUDIT in the workplace (Saunders et al., 1993). A significant difference in the change in alcohol consumption (g/week) after 6 months was observed between the brief advice and counseling and PIL groups. Our results are comparable with the estimated effect size (−2.25 standard units/week, 95% confidence interval [CI]: −4.20 to −0.30) from a previous meta-analysis concerning SBI in the workplace (Yuvaraj et al., 2019). Compared with other studies, however, our effect size was more significant. Likewise, in the primary care setting, a Cochrane review described that the difference in the quantity of alcohol consumed after 12 months between standard intervention and no or minimal interventions was estimated to be −20 g/week (95% CI: −28 to −12) (−0.86 US fl.oz./week [95% CI: −1.21 to −0.52]; Kaner et al., 2018). Although alcohol consumption in the brief advice and counseling group decreased 12 months after the intervention, the difference relative to the PIL group was not significant. The unexpected reduction in alcohol consumption in the PIL group might be responsible for the lack of statistical significance. Although a comparison between the 15-min brief advice and counseling group and the 5-min brief advice group was not included in our primary hypothesis, we compared their weekly alcohol consumption at 6 and 12 months by using an unpaired *t*-test. The results showed no significant difference in the weekly alcohol consumption between the two intervention groups at 6 and 12 months. However, while the weekly alcohol consumption at 6 months decreased significantly compared with the baseline in the 15-min intervention group, it did not decrease in the 5-min brief advice group throughout the trial. Our findings indicate that although single-point 15-min brief advice and counseling can be effective in reducing alcohol consumption, 5-min brief advice may be insufficient. Considering the conclusion of the Cochrane review that longer (more intensive) brief interventions add no significant additional benefit over standard (20-min) input in primary care, single-point 15-min brief advice and counseling may be the optimal option. Moreover, our findings indicated our intervention potentially provides effectiveness even if we evaluate the outcomes in the AUDIT-C score. However, several trials that evaluated the outcome of the AUDIT showed inconsistent results. A study in the primary care setting did not support the delivery of 5-min brief advice or 20-min brief lifestyle counseling over and above the delivery of feedback on screening a PIL (Kaner et al., 2013). Another study in the general population tentatively supported the impact of an ultra-brief

TABLE 2 Alcohol consumption at baseline and follow-up by treatment status ($n = 351$: Participants who withdrew during the follow-up period were assumed not to have changed their drinking behavior since baseline).

	All participants ($n = 351$)		Information leaflet ($n = 111$)		Brief advice/counseling ($n = 128$)		5-min brief advice ($n = 112$)	
	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value
Weekly alcohol consumption (g/week)								
Baseline	268.8 (187.6)	Ref	260.1 (188.0)	Ref	286.2 (211.4)	Ref	257.4 (155.6)	Ref
6 months	262.9 (185.5)	0.492[a]	273.6 (205.3)	0.409[a]	250.8 (176.7)	0.02[a]	266.1 (175.2)	0.499[a]
12 months	255.8 (202.4)	0.182[a]	246.7 (188.6)	0.371[a]	257.0 (225.0)	0.134[a]	263.3 (189.4)	0.694[a]
% change								
Baseline to 6 months	−2.2		5.2		−12.4		3.4	
Baseline to 12 months	−4.8		−5.2		−10.2		2.3	
Changes in alcohol consumption (g/week)								
Baseline to 6 months	−5.9 (161.1)	NA	13.5 (171.1)	Ref	−35.4 (170.0)	0.035[b]	8.6 (134.6)	0.963[b]
Baseline to 12 months	−13.0 (182.4)	NA	−13.4 (157.3)	Ref	−29.2 (219.0)	0.726[b]	5.9 (157.9)	0.642[b]
	n (%)	*p*-Value	*n* (%)	*p*-Value	*n* (%)	*p*-Value	*n* (%)	*p*-Value
Frequency of drinking >5 days/week								
Baseline	251 (71.5)	Ref	78 (70.3)	Ref	90 (70.3)	Ref	83 (74.1)	Ref
6 months	240 (68.4)	0.082[c]	79 (71.2)	1.00[c]	84 (65.6)	0.146[c]	77 (68.8)	0.146[c]
12 months	234 (66.7)	0.022[c]	69 (62.2)	0.035[c]	83 (64.8)	0.143[c]	82 (73.2)	1.00[c]
% change								
Baseline to 6 months	−4.4		1.3		−6.7		−7.2	
Baseline to 12 months	−6.8		−11.5		−7.8		−1.2	
Binge drinking in the previous 30 days								
Baseline	258 (73.5)	Ref	80 (72.1)	Ref	99 (77.3)	Ref	79 (70.5)	Ref
6 months	235 (67.0)	0.017[c]	79 (71.2)	1.00[c]	83 (64.8)	0.01[c]	73 (65.2)	0.345[c]
12 months	211 (60.1)	0.000[c]	63 (56.8)	0.009[c]	80 (62.5)	0.002[c]	68 (60.7)	0.043[c]
% change								
Baseline to 6 months	−8.9		−1.3		−16.2		−7.6	
Baseline to 12 months	−18.2		−21.3		−19.2		−13.9	
	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value
AUDIT-C total score (0 to 12 points)								
Baseline	7.4 (2.5)	Ref	7.3 (2.4)	Ref	7.5 (2.7)	Ref	7.2 (2.2)	Ref
6 months	7.1 (2.5)	0.010[a]	7.1 (2.5)	0.305[a]	6.9 (2.6)	0.003[a]	7.2 (2.5)	0892[a]
12 months	6.8 (2.8)	0.000[a]	6.6 (2.9)	0.004[a]	6.8 (2.9)	0.004[a]	6.8 (2.6)	0.137[a]
AUDIT-C score: frequency of drinking (0 to 4 points)								
Baseline	3.6 (0.8)	Ref	3.5 (0.8)	Ref	3.5 (0.8)	Ref	3.6 (0.7)	Ref
6 months	3.5 (0.8)	0.041[a]	3.5 (0.9)	0.820[a]	3.5 (0.9)	0.114[a]	3.6 (0.7)	0.131[a]
12 months	3.5 (0.9)	0.004[a]	3.3 (0.9)	0.013[a]	3.4 (0.8)	0.131[a]	3.6 (0.8)	0.356[a]
AUDIT-C score: the amount of drinking (0 to 4 points)								
Baseline	1.5 (1.2)	Ref	1.6 (1.3)	Ref	1.6 (1.3)	Ref	1.4 (1.1)	Ref
6 months	1.4 (1.2)	0.048[a]	1.5 (1.2)	0.181[a]	1.4 (1.2)	0.024[a]	1.4 (1.2)	0.737[a]
12 months	1.4 (1.2)	0.008[a]	1.4 (1.2)	0.070[a]	1.4 (1.3)	0.033[a]	1.3 (1.1)	0.626[a]
AUDIT-C score: frequency of binge drinking (0 to 4 points)								
Baseline	2.3 (1.3)	Ref	2.2 (1.4)	Ref	2.4 (1.3)	Ref	2.2 (1.2)	Ref
6 months	2.1 (1.3)	0.043[a]	2.2 (1.3)	0.597[a]	2.1 (1.4)	0.008[a]	2.2 (1.3)	0.933[a]
12 months	2.0 (1.4)	0.000[a]	1.9 (1.5)	0.008[a]	2.0 (1.5)	0.004[a]	2.0 (1.4)	0.084[a]

[a]*p* Values are derived from paired *t*-tests within each group unless otherwise indicated.

[b]One-way analysis of variance across the three groups. Post hoc Dunnett's test for comparisons with the patient information leaflet group.

[c]*p* Values are derived from McNemar's tests for paired proportions within each group, unless otherwise indicated.

[d]Binge drinking is defined as having more than 60 g of undiluted alcohol on one occasion.

TABLE 3 Alcohol consumption at baseline and 6 months by treatment status ($n = 338$: Participants available for follow-up at 6 months were included in the analysis).

	All participants ($n = 338$)		Information leaflet ($n = 106$)		Brief advice/counseling ($n = 123$)		5-min brief advice ($n = 109$)	
	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value
Weekly alcohol consumption (g/week)								
Baseline	268.6 (188.2)	Ref	257.9 (191.2)	Ref	290.7 (211.3)	Ref	253.9 (153.8)	Ref
6 months	262.3 (186.1)	0.486[a]	272.0 (209.2)	0.409[a]	253.6 (176.1)	0.019[a]	262.8 (174.3)	0.499[a]
12 months								
% change								
Baseline to 6 months	−2.3		5.5		−12.8		3.5	
Baseline to 12 months								
Changes in alcohol consumption (g/week)								
Baseline to 6 months	−6.2 (164.1)	NA	14.1 (175.1)	Ref	−37.1 (173.2)	0.034[b]	8.9 (136.4)	0.960[b]
Baseline to 12 months								
	n (%)	*p*-Value	*n* (%)	*p*-Value	*n* (%)	*p*-Value	*n* (%)	*p*-Value
Frequency of drinking >5 days/week								
Baseline	242 (71.6)	Ref	73 (68.9)	Ref	88 (71.5)	Ref	81 (74.3)	Ref
6 months	231 (68.3)	0.082[c]	74 (69.8)	1.00[c]	82 (66.7)	0.146[c]	75 (68.8)	0.146[c]
12 months								
% change								
Baseline to 6 months	−4.5		1.4		−6.8		−7.4	
Baseline to 12 months								
Binge drinking in the previous 30 days								
Baseline	247 (73.1)	Ref	75 (70.8)	Ref	96 (78.0)	Ref	76 (69.7)	Ref
6 months	224 (66.3)	0.017[c]	74 (69.8)	1.00[c]	80 (65.0)	0.010[c]	70 (64.2)	0.345[c]
12 months								
% change								
Baseline to 6 months	−9.3		−1.3		−16.7		−7.9	
Baseline to 12 months								
	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value	Mean (SD)	*p*-Value
AUDIT-C total score (0 to 12 points)								
Baseline	7.4 (2.5)	Ref	7.3 (2.5)	Ref	7.6 (2.7)	Ref	7.1 (2.2)	Ref
6 months	7.0 (2.5)	0.010[a]	7.1 (2.6)	0.305[a]	6.9 (2.6)	0.003[a]	7.1 (2.5)	0892[a]
12 months								
AUDIT-C score: frequency of drinking (0 to 4 points)								
Baseline	3.6 (0.8)	Ref	3.5 (0.8)	Ref	3.5 (0.8)	Ref	3.6 (0.7)	Ref
6 months	3.5 (0.8)	0.041[a]	3.5 (0.9)	0.820[a]	3.5 (0.9)	0.114[a]	3.6 (0.8)	0.131[a]
12 months								
AUDIT-C score: the amount of drinking (0 to 4 points)								
Baseline	1.5 (1.3)	Ref	1.6 (1.3)	Ref	1.6 (1.3)	Ref	1.4 (1.1)	Ref
6 months	1.4 (1.2)	0.048[a]	1.5 (1.2)	0.181[a]	1.4 (1.2)	0.024[a]	1.4 (1.2)	0.737[a]
12 months								
AUDIT-C score: frequency of binge drinking (0 to 4 points)								
Baseline	2.3 (1.3)	Ref	2.2 (1.4)	Ref	2.4 (1.3)	Ref	2.2 (1.2)	Ref
6 months	2.1 (1.3)	0.043[a]	2.2 (1.3)	0.597[a]	2.1 (1.4)	0.008[a]	2.2 (1.3)	0.933[a]
12 months								

[a]P values are derived from paired t-tests within each group unless otherwise indicated.

[b]One-way analysis of variance across the three groups. Post hoc Dunnett's test for comparisons with the patient information leaflet group.

[c]P values are derived from McNemar's tests for paired proportions within each group, unless otherwise indicated.

[d]Binge drinking is defined as having more than 60 g of undiluted alcohol on one occasion.

ALCOHOLISM CLINICAL & EXPERIMENTAL RESEARCH

TABLE 4 Results of generalized linear mixed-effects models to compare the changes in alcohol consumption (g/week) at 6 months ($n = 333$: Participants who completed the follow-up both at 6 and 12 months).

	Model 1				Model 2				Model 3			
Fixed effects	Coefficient (SE)	*Z*-value	*p*-Value	95% CI	Coefficient (SE)	*Z*-value	*p*-Value	95% CI	Coefficient (SE)	*Z*-value	*p*-Value	95% CI
Allocated group												
Information leaflet	Reference				Reference				Reference			
Brief advice/counseling	−52.2 (22.5)	−2.32	0.02	−96.3, −8.0	−53.3 (22.4)	−2.38	0.02	−97.2, −9.3	−40.2 (19.9)	−2.02	0.04	−79.3, −1.2
5-min brief advice	−5.0 (23.2)	−0.22	0.83	−50.4, 40.4	−9.9 (23.2)	−0.43	0.67	−55.3, 35.6	−13.0 (20.6)	−0.63	0.53	−53.3, 27.3
Sex												
Male	Reference				Reference				Reference			
Female	-	-	-	-	−103.4 (69.3)	−1.49	0.14	−239.3, 32.4	−66.6 (61.7)	−1.08	0.28	−187.6, 54.4
Age		-	-	-	1.1 (1.0)	1.16	0.25	−0.8, 3.0	2.6 (0.9)	3.00	0.00	0.9, 4.3
Weekly alcohol consumption at baseline	-	-	-	-	-	-	-	-	−0.4 (0.0)	−9.21	0.00	−0.5, −0.3

Note: Model 1: we designed the participants as a random effect, while the allocated group was treated as a fixed effect. Model 2: we designed the participants as a random effect, while the allocated group, sex, and age were treated as a fixed effect. Model 3: we designed the participants as a random effect, while the allocated group, sex, age, and weekly alcohol consumption at baseline were treated as a fixed effect.

Abbreviations: CI, confidence interval; SE, standard error.

TABLE 5 Results of generalized linear mixed-effects models to compare the changes in alcohol consumption (g/week) at 12 months ($n = 333$: Participants who completed the follow-up both at 6 and 12 months).

	Model 1				Model 2				Model 3			
Fixed effects	Coefficient (SE)	*Z*-value	*p*-Value	95% CI	Coefficient (SE)	*Z*-value	*p*-Value	95% CI	Coefficient (SE)	*Z*-value	*p*-Value	95% CI
Allocated group												
Information leaflet	Reference				Reference				Reference			
Brief advice/counseling	−22.3 (25.4)	−0.88	0.38	−72.1, 27.5	−23.1 (25.2)	−0.92	0.36	−72.4, 26.3	−10.4 (23.2)	−0.45	0.65	−55.8, 34.9
5-min brief advice	17.1 (26.2)	0.65	0.51	−34.2, 68.4	11.7 (26.0)	0.45	0.65	−39.4, 62.7	8.7 (23.9)	0.36	0.72	−38.2, 55.5
Sex												
Male	Reference				Reference				Reference			
Female	–	–	–	–	−199.3 (77.9)	−2.56	0.01	−351.9, −46.7	−163.6 (71.5)	−2.29	0.02	−303.8, −23.4
Age	–	–	–	–	−0.2 (1.1)	−0.19	0.85	−2.3, 1.9	1.3 (1.0)	1.23	0.22	−0.7, 3.2
Weekly alcohol consumption at baseline	–	–	–	–	–	–	–	–	−0.4 (0.1)	−7.67	0.00	−0.5, −0.3

Note: Model 1: we designed the participants as a random effect, while the allocated group was treated as a fixed effect. Model 2: we designed the participants as a random effect, while the allocated group, sex, and age were treated as a fixed effect. Model 3: we designed the participants as a random effect, while the allocated group, sex, age, and weekly alcohol consumption at baseline were treated as a fixed effect.

Abbreviations: CI, confidence interval; SE, standard error.

intervention (Cunningham et al., 2012). Further studies are required to investigate the necessary length and modality of brief interventions across settings, populations, and outcomes.

Moreover, it is worth mentioning that the effectiveness of brief interventions by nurses was demonstrated in this study. Considering the suboptimal implementation of SBI in general practice owing to a lack of time and training, previous studies have explored the feasibility, acceptability, and effectiveness of SBI by nurses (Lane et al., 2008; Lock et al., 2006; Mertens et al., 2014). As Lock et al. (2006) mentioned, nurses are theoretically appropriate agents for SBI. However, nurse-delivered SBI has failed to show consistent effectiveness. In our opinion, cultural-specific reasons might explain the reason why a more significant effect size was obtained compared with other studies. Japanese society might have been tolerant of alcohol consumption (Higuchi et al., 2007). It is possible that even heavy drinkers rarely received advice or counseling focusing on alcohol reduction as part of health guidance at the workplace. For Japanese workers in this unique culture, our intervention might be an impressive and novel approach. Indeed, our findings encourage the broader implementation of nurse-delivered SBI in primary healthcare settings. Future research should examine the efficacy of nurse-delivered SBI in various settings.

Concerning the frequency of drinking and binge drinking, improvement in drinking behavior was observed throughout the trial within all three groups. In particular, binge drinking in the previous 30 days significantly decreased in the brief advice and counseling group. This result is consistent with the literature (Kaner et al., 2018). Notably, a significant reduction in the frequency of binge drinking was observed within all three groups at 12 months. The coronavirus pandemic in June 2020 may have influenced our trial. The alcohol drinking behavior of 280 participants (79.7% of 351 baseline participants) at 12 months was measured between June and December 2020. Most people were forced to abstain from drinking parties by their employers during this period. Thus, we considered the abstinence from excessive drinking at restaurants might explain our unexpected findings.

Limitations

This study had several limitations. First, selection bias may have been present, precluding meaningful discussions about generalizability, which requires more extensive studies. The participants were predominantly men. Hence, strategies to screen harmful or hazardous female drinkers and intervene effectively should be developed. Second, the measurement of weekly alcohol consumption differed from those typically used (Sobell et al., 1990). Third, although blinding was performed for outcome assessment, in line with previous studies, this study did not involve blinding of participants because of the nature of the intervention. Fourth, our trial did not show a reduction in alcohol-related consequences, although reduced alcohol consumption was observed. However, previous literature indicated that reducing alcohol consumption led to benefits in physical, mental, and societal health and life quality (Charlet & Heinz, 2017). Finally, there is evidence that drawing attention to hazardous drinking is enough to limit drinking or that the social desirability effect, even in a control group, may dampen a behavior during the measurement period. Besides, the unexpected coronavirus disease 2019 pandemic might have affected the outcome evaluation of our study.

CONCLUSIONS

In conclusion, our trial showed that the delivery of 15-min brief advice and counseling by nurses to AUDIT-screened participants was effective in reducing excessive alcohol consumption in a workplace setting. The effectiveness of the single-point SBI was evident 6 months. The results provide evidence that occupational health staff should use this implementable SBI in daily practice. Indeed, the implications of our study are relevant to occupational health services in Japan. As mentioned in the literature (Ito et al., 2015), the workplace is expected to become an important venue for SBI in Japan. This evidence can help facilitate the implementation of SBI in the workplace, which plays a crucial role in preventing the burden of harmful and hazardous alcohol use.

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CONFLICT OF INTEREST

All authors declared that they have no conflicts of interest.

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REFERENCES

Araki, I., Hashimoto, H., Kono, K., Matsuki, H. & Yano, E. (2006) Controlled trial of worksite health education through face-to-face counseling vs. e-mail on drinking behavior modification. *Journal of Occupational Health*, 48, 239–245.

Babor, T.F., Acuda, W., Campillo, C. & Del Boca, F.K. (1996) A cross-national trial of brief interventions with heavy drinkers. WHO brief intervention study group. *American Journal of Public Health*, 86, 948–955.

Ballesteros, J., Duffy, J.C., Querejeta, I., Ariño, J. & González-Pinto, A. (2004) Efficacy of brief interventions for hazardous drinkers in primary care: systematic review and meta-analyses. *Alcoholism, Clinical and Experimental Research*, 28, 608–618.

Bertholet, N., Daeppen, J.B., Wietlisbach, V., Fleming, M. & Burnand, B. (2005) Reduction of alcohol consumption by brief alcohol

intervention in primary care: systematic review and meta-analysis. *Archives of Internal Medicine*, 165, 986–995.
Charlet, K. & Heinz, A. (2017) Harm reduction-a systematic review on effects of alcohol reduction on physical and mental symptoms. *Addiction Biology*, 22, 1119–1159.
Cunningham, J.A., Neighbors, C., Wild, C. & Humphreys, K. (2012) Ultra-brief intervention for problem drinkers: results from a randomized controlled trial. *PLoS One*, 7, e48003.
Dawson, D.A., Grant, B.F., Stinson, F.S. & Zhou, Y. (2005) Effectiveness of the derived alcohol use disorders identification test (AUDIT-C) in screening for alcohol use disorders and risk drinking in the US general population. *Alcoholism, Clinical and Experimental Research*, 29, 844–854.
DiClemente, C.C., Bellino, L.E. & Neavins, T.M. (1999) Motivation for change and alcoholism treatment. *Alcohol Research & Health*, 23, 86–92.
Fleming, M.F., Barry, K.L., Manwell, L.B., Johnson, K. & London, R. (1997) Brief physician advice for problem alcohol drinkers. A randomized controlled trial in community-based primary care practices. *JAMA*, 277, 1039–1045.
Funk, M., Wutzke, S., Kaner, E., Anderson, P., Pas, L., McCormick, R. et al. (2005) A multicountry controlled trial of strategies to promote dissemination and implementation of brief alcohol intervention in primary health care: findings of a World Health Organization collaborative study. *Journal of Studies on Alcohol*, 66, 379–388.
Harada, K., Moriyama, M., Uno, M., Kobayashi, T. & Yuzuriha, T. (2015) Effects of a revised moderate drinking program for enhancing behavior modification in the workplace for heavy drinkers: a randomized controlled trial in Japan. *Health*, 7, 1601–1614.
Hettema, J., Steele, J. & Miller, W.R. (2005) Motivational interviewing. *Annual Review of Clinical Psychology*, 1, 91–111.
Higuchi, S., Matsushita, S., Maesato, H. & Osaki, Y. (2007) Japan: alcohol today. *Addiction*, 102, 1849–1862.
Ito, C., Yuzuriha, T., Noda, T., Ojima, T., Hiro, H. & Higuchi, S. (2015) Brief intervention in the workplace for heavy drinkers: a randomized clinical trial in Japan. *Alcohol and Alcoholism*, 50, 157–163.
Iyadomi, M., Endo, K., Yuzuriha, T., Hara, T. & Ichiba, M. (2013) Effects of a group alcohol intervention (S-HAPPY program) at the workplace for high risk alcohol drinkers using the framework of the specific health examination and health guidance system of the metabolic syndrome. *Journal of Science of Labour*, 89, 155–165.
Kaner, E., Bland, M., Cassidy, P., Coulton, S., Dale, V., Deluca, P. et al. (2013) Effectiveness of screening and brief alcohol intervention in primary care (SIPS trial): pragmatic cluster randomised controlled trial. *BMJ*, 346, e8501.
Kaner, E.F., Beyer, F.R., Muirhead, C., Campbell, F., Pienaar, E.D., Bertholet, N. et al. (2018) Effectiveness of brief alcohol interventions in primary care populations. *Cochrane Database of Systematic Reviews*, 2, CD004148.
Kurihama National Hospital. (2019) Getting on well with alcohol. Available from: https://kurihama.hosp.go.jp/research/education/tool.html [Accessed 24th January 2022].
Kuwabara, Y., Kinjo, A., Fujii, M., Minobe, R., Maesato, H., Higuchi, S. et al. (2021) Effectiveness of screening and brief alcohol intervention at the workplace: a study protocol for a randomized controlled trial at five Japan-based companies. *Yonago Acta Medica*, 64, 330–338.
Lane, J., Proude, E.M., Conigrave, K.M., de Boer, J.P. & Haber, P.S. (2008) Nurse-provided screening and brief intervention for risky alcohol consumption by sexual health clinic patients. *Sexually Transmitted Infections*, 84, 524–527.
Lock, C.A., Kaner, E., Heather, N., Doughty, J., Crawshaw, A., McNamee, P. et al. (2006) Effectiveness of nurse-led brief alcohol intervention: a cluster randomized controlled trial. *Journal of Advanced Nursing*, 54, 426–439.
Mertens, J.R., Ward, C.L., Bresick, G.F., Broder, T. & Weisner, C.M. (2014) Effectiveness of nurse-practitioner-delivered brief motivational intervention for young adult alcohol and drug use in primary care in South Africa: a randomized clinical trial. *Alcohol and Alcoholism*, 49, 430–438.
Moyer, A., Finney, J.W., Swearingen, C.E. & Vergun, P. (2002) Brief interventions for alcohol problems: a meta-analytic review of controlled investigations in treatment-seeking and non-treatment-seeking populations. *Addiction*, 97, 279–292.
Rekve, D., Banatvala, N., Karpati, A., Tarlton, D., Westerman, L., Sperkova, K. et al. (2019) Prioritising action on alcohol for health and development. *BMJ*, 367, l6162.
Saitz, R. (2010) Alcohol screening and brief intervention in primary care: absence of evidence for efficacy in people with dependence or very heavy drinking. *Drug and Alcohol Review*, 29, 631–640.
Saunders, J.B., Aasland, O.G., Babor, T.F., De la Fuente, J.R. & Grant, M. (1993) Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption-II. *Addiction*, 88, 791–804.
Sobell, L.C., Toneatto, T., Sobell, M.B., Schuller, R. & Maxwell, M. (1990) A procedure for reducing errors in reports of life events. *Journal of Psychosomatic Research*, 34, 163–170.
The University Hospital Medical Information Network (UMIN). (n.d.) Clinical Trials Registry. Available from: https://www.umin.ac.jp/ctr/ [Accessed 24th January 2022].
Tottori University. (n.d.) Alcohol brief intervention tool materials. Available from: https://www.med.tottori-u.ac.jp/introduction/medicine/about/3318/3327/23771.html [Accessed 24th January 2022].
Whitlock, E.P., Polen, M.R., Green, C.A., Orleans, T., Klein, J. & U.S. Preventive Services Task Force. (2004) Behavioral counseling interventions in primary care to reduce risky/harmful alcohol use by adults: a summary of the evidence for the US preventive services task force. *Annals of Internal Medicine*, 140, 557–568.
World Health Organization. (2001) *AUDIT: the alcohol use disorders identification test: guidelines for use in primary health care*. Geneva: World Health Organization.
World Health Organization. (2018) *Global status report on alcohol and health 2018*. Geneva: World Health Organization.
World Health Organization. (n.d.) Alcohol, heavy episodic drinking (drinkers only) past 30 days. Available from: https://www.who.int/data/gho/indicator-metadata-registry/imr-details/458 [Accessed 31st March 2022].
Yuvaraj, K., Eliyas, S.K., Gokul, S. & Manikandanesan, S. (2019) Effectiveness of workplace intervention for reducing alcohol consumption: a systematic review and meta-analysis. *Alcohol and Alcoholism*, 54, 264–271.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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ORIGINAL PAPER

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日本におけるアルコールの他者への害

Alcohol's harm to others in Japan: Different rates for different relationships to the drinker in a 2018 national survey

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Abstract

Introduction: No study in Japan has investigated alcohol's harm to others (AHTO). Therefore, this study aimed to reveal the situation of AHTO in Japan and examine the factors associated with it based on the relationship with the drinker.

Methods: A cross-sectional population-based survey was performed in 2018 with 2121 men and 2507 women. Respondents were asked questions about factors such as verbal or physical aggression, being forced to drink alcohol, sexual harassment and their relationship with the drinker. Binomial logistic regression was performed to quantify the associations of AHTO with participants' socio-demographic status and drinking patterns.

Results: The lifetime experience of AHTO was 24.7% for men and 19.3% for women. AHTO from the father and co-workers were the most common in and outside the home, respectively. The frequency of AHTO from the spouse or co-workers showed no significant difference for abstainers and drinkers. However, AHTO from the father was more commonly reported among drinkers and those with Alcohol Use Disorders Identification Test scores ≥8 points than abstainers. Of those who experienced AHTO, 24.5% of men and 27.6% of women, and 6.1% of men and 12.9% of women were profoundly affected by it in and outside the home, respectively.

Discussion and Conclusions: One in five Japanese residents experienced AHTO in their life, and the characteristics associated with AHTO differed according to the affected individual's relationship with the drinker. Continued monitoring of AHTO and measures aimed at reducing alcohol-related harm that include AHTO should be promoted.

KEYWORDS
alcohol, family, gender, harm to others, workplace

Key Points

- Lifetime experience of alcohol's harm to others (AHTO) in Japan was 24.7% for men and 19.3% for women.
- AHTO from spouses or co-workers was experienced by abstainers and drinkers.

- AHTO from the father was more commonly reported among drinkers and problem drinkers.
- AHTO in the home had a more profound impact on respondents compared to AHTO outside the home.

1 | INTRODUCTION

Alcohol use is a prominent cause of disease and injury [1, 2]. Moreover, drinking causes physical, psychological and social harm not only to the drinkers but also to those around them [3–5]. In the past, the harm caused by alcohol consumption of others was mainly studied in the context of traffic accidents and violence [2]. Subsequently, the concept of alcohol's harm to others (AHTO) was proposed, and research has since been conducted on the facets of harm, such as insults and financial problems, in addition to tangible harm [6–8].

The only report on AHTO in Japan is a 2001 nationwide survey related to the facets of being forced to drink and domestic violence [9, 10]. In Japan, young people are not allowed to refuse alcohol that is offered by those older or superior to them; consequently, being forced to drink has become a problem in workplaces and universities. Death of young people by alcohol poisoning after being forced to drink began to be considered a problem in the 1980s [11]. According to a survey, 3.2% of men and 3.4% of women had been forced to drink by their spouse or partner, and 9.0% of men and 7.1% of women had been forced to drink by their co-workers or classmates [9]. About 4% of men and 28.2% of women reported that when domestic violence occurred, their partner was under the influence of alcohol, and 17.3% of men and 0.0% of women reported that they themselves were drinking [10]. However, no studies have explored other drinkers' AHTO in Japan. Therefore, this study aimed to reveal the situation of AHTO in Japan.

AHTO from close relationships such as that of a spouse, partner and other family members was more likely to be reported by women, while AHTO from co-workers and strangers was more likely to be reported by men [7, 12–14]. Being younger, unemployed or a casual worker, and having a heavy drinker in the household elevated the risk of AHTO [7, 12, 13]. Regarding drinking patterns of harmed individuals, habitual heavy drinking or binge drinking increased the risk of AHTO [7, 13, 15]. However, the risk factors for AHTO with respect to marital status and income vary according to the type of AHTO and their relationship with the drinker [7, 12, 16].

Additionally, AHTO, such as threats, fears and economic problems due to family or spousal drinking, is associated with distress and decreased quality of life for the recipient [17, 18]. Therefore, in Japan, the extent to which AHTO affects later life should be explored to enhance the measures to reduce the same.

The background factors associated with AHTO, and its impact or severity may differ according to the relationship with the drinker. Therefore, this study examined the associated factors according to the relationship with the drinker and the impact of AHTO on participants. The study aimed to:

1. estimate the proportion of adults in Japan, who experienced AHTO in their lifetime according to the type of harm and relationship with the drinker;
2. analyse the associated factors of adults who experienced AHTO according to the relationship with the drinker;
3. determine the proportion of adults who were profoundly affected by AHTO; and
4. identify the type of AHTO that profoundly impacted the recipient.

2 | METHODS

2.1 | Study design

This cross-sectional study was conducted in February and March 2018, and adults were randomly sampled from all regions of Japan. Participants were recruited using a stratified two-stage random-sampling approach. The strata were determined by first dividing the survey districts into 11 areas (Hokkaido, Tohoku, Kanto, Hokuriku, Tosan, Tokai, Kinki, Chugoku, Shikoku, Northern Kyushu and Southern Kyushu) and then into 5 groups classified by municipality size (large cities, $n = 14$; cities with populations ≥300,000, ≥100,000 and <100,000, and smaller towns and villages). The survey districts were selected from each stratum in proportion to the adult (≥20 years old) population. A survey request document was sent to the municipal office after the survey district was randomly selected. The participants were then randomly selected by the investigator from the resident register at the municipal office. Finally, 8000 people from all over Japan were selected. Trained investigators visited the respondents' homes and interviewed them. The investigator obtained informed consent from participants after providing a comprehensive explanation of the

investigation. There were 4628 participants and the response rate was 57.9%. The study protocol was approved by the Ethics Committee of the Kurihama Medical and Addiction Centre (Approval number: 317).

2.2 | Indicators of AHTO

We assessed AHTO in and outside the home as a separate question. Respondents were presented with a list of types of harm for each respondent-drinker relationship and asked to indicate those that they had experienced in their lifetime. The types of harm presented were verbal or physical aggression, insults, being forced to drink alcohol, sexual harassment, cleaning up after a drinker's problematic behaviour, financial problems and 'other'. For relationship with the drinkers in the home, respondents were asked about their grandfather, grandmother, father, mother, spouse, siblings, children and other housemates. For relationship with the drinkers outside the home, respondents were asked about relatives, neighbours, co-workers, business partners, friends, strangers and others. Furthermore, those with at least one AHTO experience inside or outside the home were asked to indicate the extent to which the experience had affected them using a four-point scale: had no effect, a slight effect, a considerable effect and a severe effect. Those who answered 'had a considerable effect' or 'had a severe effect' were categorised as people who were profoundly affected by AHTO.

2.3 | Socio-demographic status and drinking patterns

Participants were classified into the following age groups: 20–49, 50–64 and ≥65 years. Educational attainment was classified into four categories: ≤9 (junior high school level), 10–12 (senior high school level), 13–15 (technical school level or current university students), and ≥16 years (university and graduate school level). Marital status was classified into three categories: married or living with a partner, bereaved or divorced, and unmarried. Annual household income was classified into three categories: <36,800 US dollars (4,000,000 yen), 36,800–73,600 US dollars (4,000,000–8000,000 yen) and ≥73,600 US dollars (8,000,000 yen) (100 yen = 0.92 dollars as of 1 February 2018). In 2016, the median and average household incomes in Japan were approximately 40,664 US dollars (4,420,000 yen) and 51,538 US dollars (5,602,000 yen), respectively [19]. Utilising the Alcohol Use Disorders Identification Test (AUDIT), drinking patterns were classified into three categories: drinkers with AUDIT scores ≥8, drinkers with AUDIT scores <8 and lifetime abstainers. The guidelines define AUDIT scores ≥8 as an excess of low-risk drinking [20].

2.4 | Statistical analyses

A total of 4628 individuals participated in the 2018 nationwide survey; the participants' characteristics have been mentioned in a previous report [21]. Of the 4628 participants, one participant did not respond to the questions about AHTO both in and outside the home and was, therefore, excluded from this study. Another participant did not respond to the question about AHTO in the home but responded to the question about AHTO outside the home. We included this participant and classified their AHTO in the home as 'none'. Finally, our study included 4627 participants (2121 men and 2506 women). Of the 4627 participants, the numbers of non-respondents to the questions on marital status, educational attainment and household income were 10, 7 and 1075, respectively. These non-respondents were included with an indicator of missing data.

The data were weighted based on Japan's population on 1 October 2017 to estimate the age-standardised proportions of adults who had experienced AHTO in their lifetime, and those who were profoundly affected by AHTO.

The chi-squared test and Fisher's exact test were used to compare the prevalence of AHTO from five major perpetrators according to socio-demographic status and drinking patterns (Table S1, Supporting Information). Next, five sets of binomial logistic regression models were performed to estimate the odds ratio (OR) for AHTO according to the relationships with the aforementioned perpetrators associated with socio-demographic status and drinking patterns. In the model, the experience of AHTO according to the relationship with the drinker was set as the dependent variable, and gender, age, marital status, educational attainment, annual household income and drinking patterns were included as independent variables. The dependent variables were as follows: AHTO from the father, AHTO from the spouse, AHTO from co-workers, AHTO from friends and AHTO from strangers. For instance, when we estimated the OR for AHTO from the father, those who had never experienced AHTO from fathers were used as reference. Spearman's model confirmed that no strong correlations existed between the independent variables. The goodness of fit of the model was checked using the Hosmer–Lemeshow test. Statistical analyses were performed using SPSS Statistics software version 25.0 for Windows (IBM Corp., Armonk, NY, USA).

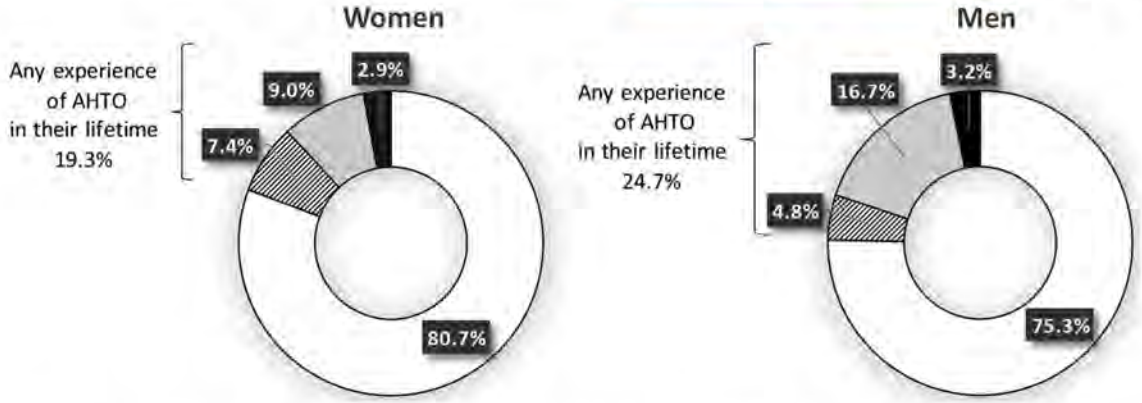

FIGURE 1 Age-standardised proportion of adults who experienced alcohol's harm to others in their lifetime among Japanese population according to gender. The left and right side represents women and men, respectively. The colours show the following: those who have never experienced alcohol's harm to others (white); those who have experienced alcohol's harm to others only in the home (lines), those who have experienced alcohol's harm to others only outside the home (dots), and those who have experienced alcohol's harm to others both in and outside the home (black). The lifetime prevalence of any alcohol's harm to others (AHTO) experience within or outside the home (except the white part) was 19.3% for women and 24.7% for men.

3 | RESULTS

The mean age was 56.3 and 55.6 years for men and women, respectively. The age-standardised proportions (95% confidence interval) of the alcohol use-related indicators were as follows: drinkers in the past 12 months accounted for 83.2% (81.7%, 84.8%) of men and 60.1% (58.2%, 61.9%) of women. Individuals with AUDIT scores ≥8 accounted for 21.4% (19.6%, 23.2%) of men and 4.5% (3.6%, 5.3%) of women.

3.1 | Age-standardised proportion of AHTO experience

Figure 1 shows the age-standardised proportions of Japanese adults who experienced AHTO in their lifetime. The lifetime prevalence of any AHTO experience in and outside the home was 24.7% (22.8%, 26.6%) for men and 19.3% (17.7%, 20.8%) for women.

Table 1 shows the age-standardised proportions of men and women who experienced AHTO according to the type of harm and relationship with those who perpetrated AHTO. Table S1 shows the age-standardised proportions of all AHTO. Regarding AHTO experienced at home, the percentage of it due to fathers was 6.2% in men and 4.6% in women, and AHTO from spouse was 0.2% in men and 3.7% in women. Regarding type of harm, verbal or physical aggression had the highest percentage.

Outside the home, 9.4% men experienced AHTO from co-workers, with the types of harm being insults (4.7%), being forced to drink alcohol (2.2%), and verbal or physical aggression (2.1%). AHTO from co-workers was experienced by 4.3% women, with the types of harm being insults (1.7%), sexual harassment (1.3%) and being forced to drink alcohol (1.0%).

3.2 | Association between AHTO experience from five major perpetrators and socio-demographic status and drinking patterns

Table 1 shows the frequency of AHTO from the father, spouse, co-workers, friends and strangers according to socio-demographic status and drinking patterns. Table 2 shows the ORs for factors associated with AHTO from the above-stated perpetrators. AHTO in the home from the father was more likely to be reported by those aged 64 and younger, never married, drinkers with AUDIT scores of <8 and ≥8 points. AHTO in the home from the spouse was more likely to be reported by women and those divorced or widowed. AHTO outside the home was more likely to be reported by those with male co-workers, aged 64 and younger, having ≥16 years of education and a household income of 36,800 US dollars or more. AHTO from friends or strangers was more likely to be reported by those with ≥10 years of education, drinkers and those with an AUDIT score ≥8 points.

3.3 | Profound impact of AHTO on respondents' life

Of those who experienced AHTO in the home, 24.5% (17.8%, 31.2%) of men and 27.6% (22.2%, 33.0%) of

TABLE 1 Age-standardised proportion of adults who experienced alcohol's harm to others according to the type of harm and relationship with the drinker

			Types of harm											
	Any experience[a]		Verbal or physical aggression		Insults		Being forced to drink		Sexual harassment		Cleaning up after drinker's problematic behaviour		Financial problems	
Relationship with the drinker	*n*	% (95% CI)	*n*	% (95% CI)	*n*	% (95% CI)	*n*	% (95% CI)	*n*	% (95% CI)	*n*	% (95% CI)	*n*	% (95% CI)
Men ($n = 2121$)														
Overall	513	24.7 (22.8, 26.6)	186	8.5 (7.3, 9.7)	256	12.1 (10.7, 13.6)	74	3.6 (2.8, 4.4)	12	0.6 (0.2, 0.9)	74	3.7 (2.9, 4.6)	16	0.8 (0.4, 1.2)
In the home	164	8.0 (6.8, 9.2)	79	3.7 (2.9, 4.5)	38	1.9 (1.3, 2.6)	8	0.4 (0.1, 0.6)	1	0.0 (0.0, 0.1)	17	0.8 (0.4, 1.1)	9	0.4 (0.1, 0.7)
From fathers	123	6.2 (5.1, 7.3)	62	3.0 (2.2, 3.7)	26	1.4 (0.9, 2.0)	7	0.3 (0.1, 0.6)	1	0.0 (0.0, 0.1)	13	0.6 (0.3, 0.9)	8	0.4 (0.1, 0.7)
From spouses	6	0.2 (0.0, 0.4)	1	0.0 (0.0, 0.1)	3	0.1 (0.0, 0.2)	1	0.0 (0.0, 0.1)	0	0.0	0	0.0	0	0.0
Outside the home	413	19.9 (18.2, 21.7)	118	5.3 (4.4, 6.3)	231	10.9 (9.6, 12.3)	68	3.3 (2.5, 4.1)	11	0.5 (0.2, 0.8)	58	3.0 (2.2, 3.8)	7	0.3 (0.1, 0.6)
From co-workers	196	9.4 (8.1, 10.7)	45	2.1 (1.5, 2.7)	102	4.7 (3.8, 5.6)	46	2.2 (1.6, 2.9)	8	0.4 (0.1, 0.6)	28	1.4 (0.9, 1.9)	2	0.1 (0.0, 0.2)
From friends	99	5.0 (4.0, 6.0)	25	1.1 (0.7, 1.5)	44	2.1 (1.5, 2.8)	12	0.6 (0.2, 0.9)	2	0.1 (0.0, 0.2)	24	1.3 (0.8, 1.8)	1	0.1 (0.0, 0.2)
From strangers	78	3.8 (3.0, 4.7)	19	0.9 (0.5, 1.3)	59	2.8 (2.1, 3.6)	2	0.1 (0.0, 0.3)	0	0.0	5	0.3 (0.0, 0.5)	0	0.0
Women ($n = 2506$)														
Overall	487	19.3 (17.7, 20.8)	190	7.4 (6.4, 8.4)	187	7.4 (6.4, 8.5)	42	1.6 (1.1, 2.1)	56	2.1 (1.6, 2.7)	77	3.1 (2.4, 3.7)	38	1.4 (1.0, 1.9)
In the home	265	10.3 (9.1, 11.5)	134	5.2 (4.3, 6.1)	72	2.9 (2.2, 3.6)	7	0.3 (0.1, 0.5)	4	0.1 (0.0, 0.3)	49	1.8 (1.3, 2.3)	34	1.3 (0.8, 1.7)
From fathers	119	4.6 (3.8, 5.4)	60	2.3 (1.7, 2.9)	34	1.4 (0.9, 1.8)	2	0.1 (0.0, 0.2)	0	0.0	21	0.8 (0.4, 1.1)	11	0.4 (0.2, 0.7)
From spouses	98	3.7 (3.0, 4.4)	49	1.9 (1.4, 2.5)	20	0.8 (0.4, 1.2)	4	0.2 (0.0, 0.3)	3	0.1 (0.0, 0.2)	21	0.7 (0.4, 1.0)	17	0.6 (0.3, 0.9)
Outside the home	297	11.9 (10.6, 13.1)	69	2.6 (2.0, 3.3)	132	5.2 (4.3, 6.0)	36	1.4 (0.9, 1.9)	52	2.0 (1.5, 2.5)	32	1.4 (0.9, 1.9)	4	0.1 (0.0, 0.3)
From co-workers	108	4.3 (3.5, 5.0)	19	0.7 (0.4, 1.0)	43	1.7 (1.2,2.2)	25	1.0 (0.6, 1.3)	34	1.3 (0.8,1.7)	8	0.4 (0.1, 0.6)	1	0.0 (0.0, 0.1)
From friends	56	2.4 (1.8, 3.0)	11	0.5 (0.2, 0.7)	17	0.7 (0.3, 1.0)	7	0.3 (0.1, 0.5)	6	0.2 (0.0, 0.4)	16	0.8 (0.4, 1.1)	0	0.0
From strangers	65	2.7 (2.0, 3.3)	12	0.5 (0.2, 0.8)	38	1.5 (1.0, 2.0)	2	0.1 (0.0, 0.2)	5	0.2 (0.0, 0.4)	2	0.1 (0.0, 0.2)	0	0.0

Abbreviations: CI, confidence interval; *n*, number of respondents who experienced the types of harm.

[a]Includes any respondent reporting at least one type of harm.

TABLE 2 Odds ratio of socio-demographic status and drinking patterns for experiences of alcohol's harm to others according to the relationship with the drinker

	In the home				Outside the home					
	From fathers		From spouses		From co-workers		From friends		From strangers	
Risk factor	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value
Gender										
Men	Reference		Reference		1.9 (1.4, 2.4)	<0.001	1.5 (1.1, 2.2)	0.023	1.0 (0.7, 1.5)	0.821
Women	1.0 (0.7, 1.3)	0.782	13.3 (5.6, 31.9)	<0.001	Reference		Reference		Reference	
Age[a], years										
20–49	2.0 (1.3, 3.0)	0.001	0.7 (0.4, 1.3)	0.245	1.9 (1.3, 2.7)	<0.001	1.1 (0.7, 1.7)	0.733	0.7 (0.4, 1.3)	0.094
50–64	2.6 (1.8, 3.8)	<0.001	1.0 (0.6, 1.7)	0.950	1.6 (1.1, 2.3)	0.012	0.8 (0.5, 1.4)	0.461	1.4 (0.8, 2.3)	0.186
Marital status[b]										
Divorced/widowed	1.5 (1.0, 2.3)	0.071	2.3 (1.4, 3.6)	<0.001	1.0 (0.6, 1.6)	0.977	0.9 (0.5, 1.9)	0.880	0.9 (0.4, 1.7)	0.658
Never married	1.5 (1.1, 2.1)	0.026	NA		1.1 (0.8, 1.5)	0.723	1.5 (1.0, 2.3)	0.056	1.1 (0.7, 1.8)	0.558
Educational attainment[c], years										
10–12	0.9 (0.5, 1.5)	0.715	0.8 (0.4, 1.3)	0.328	1.2 (0.7, 2.0)	0.497	2.9 (1.0, 8.4)	0.042	3.4 (1.0, 11.2)	0.043
13–15	0.8 (0.4, 1.4)	0.410	0.6 (0.3, 1.2)	0.165	1.2 (0.6, 2.1)	0.624	3.6 (1.2, 10.7)	0.019	4.9 (1.4, 16.4)	0.010
≥16	0.9 (0.5, 1.6)	0.729	0.7 (0.3, 1.5)	0.341	1.7 (1.0, 2.9)	0.062	4.9 (1.7, 13.9)	0.003	5.5 (1.7, 18.4)	0.005
Annual household income[d] (US dollars)										
36,800–73,600	1.0 (0.7, 1.5)	0.817	0.9 (0.5, 1.7)	0.809	1.5 (1.1, 2.1)	0.010	1.6 (1.0, 2.5)	0.065	0.8 (0.5, 1.3)	0.392
≥73,600	1.0 (0.7, 1.5)	0.977	1.3 (0.7, 2.3)	0.458	1.6 (1.1, 2.3)	0.016	1.5 (0.9, 2.5)	0.159	1.0 (0.6, 1.7)	0.990
Drinking patterns[e]										
Drinker, AUDIT <8	2.3 (1.2, 4.3)	0.011	1.0 (0.6, 1.7)	0.978	1.1 (0.7, 1.8)	0.670	2.4 (0.9, 5.9)	0.068	2.9 (1.0, 7.9)	0.043
Drinker, AUDIT ≥8	2.9 (1.4, 5.9)	0.003	1.5 (0.6, 3.8)	0.379	1.6 (0.9, 2.8)	0.088	4.9 (1.9, 13.0)	0.001	6.2 (2.1, 18.1)	<0.001

Abbreviations: AUDIT, Alcohol Use Disorders Identification Test; CI, confidence interval; OR, odds ratio.

[a]Reference groups: Age = 65 and older.

[b]Marital status = married, living with partner.

[c]Educational attainment = 1–9 years.

[d]Annual household income ≤ 36,800 US dollars.

[e]Drinking pattern = lifetime abstainer.

TABLE 3 Proportion of adults who were profoundly affected by alcohol's harm to others according to the type of harm and relationship with the drinker

	Types of harm																	
	Verbal or physical aggression			Insult			Being forced to drink			Sexual harassment			Cleaning up after drinker's problematic behaviour			Financial problems		
	No (%)	Yes (%)	*p*-value	No (%)	Yes (%)	*p*-value	No (%)	Yes (%)	*p*-value	No (%)	Yes (%)	*p*-value	No (%)	Yes (%)	*p*-value	No (%)	Yes (%)	*p*-value
Men																		
Fathers	15.3	39.3	0.001	23.1	32.0	0.344	25.0	14.3	1.000	NA	NA	NA	23.3	38.5	0.223	24.5	25.0	1.000
Spouses	NA	NA	NA	25.0	0.0	1.000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Co-workers	4.7	17.8	0.001	6.5	5.0	0.570	6.1	6.5	0.753	6.3	0.0	1.000	6.1	7.1	0.686	6.2	0.0	1.000
Friends	6.3	4.0	1.000	6.6	2.3	0.500	6.3	0.0	1.000	6.2	0.0	1.000	6.5	0.0	0.384	NA	NA	NA
Strangers	5.9	10.5	0.327	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Women																		
Fathers	26.9	30.0	0.634	26.9	32.4	0.505	NA	NA	NA	NA	NA	NA	25.3	55.0	0.004	26.0	63.6	0.012
Spouses	24.1	42.9	0.008	26.6	40.0	0.196	27.6	25.0	1.000	27.1	66.7	0.185	26.3	42.9	0.103	25.0	64.7	<0.001
Co-workers	12.7	15.8	0.722	12.7	14.3	0.778	12.3	20.0	0.271	11.5	24.2	0.040	12.9	12.5	1.000	13.0	0.0	1.000
Friends	12.7	18.2	0.640	11.9	29.4	0.037	12.5	28.6	0.225	12.9	16.7	0.568	12.2	25.0	0.137	NA	NA	NA
Strangers	12.8	16.7	0.658	13.3	10.5	0.798	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note: The *p*-values were calculated using the χ^2 test or Fisher's exact test to compare yes and no. Results were shown NA if no or one person corresponded to the type of harm from each perpetrator.
Abbreviation: NA, not applicable.

women were profoundly affected. On the contrary, of those who experienced AHTO outside the home, 6.1% (3.8%, 8.4%) of men and 12.9% (9.0%, 16.8%) of women were profoundly affected.

Table 3 shows the proportions of respondents who answered that they had been profoundly affected by AHTO depending on whether they had experienced each type of harm. In the home, verbal or physical aggression from the father was related to a profound impact on men. Women were profoundly affected by cleaning up after a father's problematic behaviour, financial problems due to them, and verbal or physical aggression and financial problems from husbands. Outside the home, verbal or physical aggression from co-workers profoundly affected men, and insults from friends and sexual harassment from co-workers profoundly affected women.

4 | DISCUSSION

In this first comprehensive report of AHTO in Japan, the lifetime experience of AHTO either in or outside the home was 24.7% for men and 19.3% for women. The five main perpetrators of AHTO were fathers and spouses in the home, and co-workers, friends and strangers outside the home. Factors associated with the AHTO experience varied according to the relationship with the drinker, and the impact of AHTO differed in and outside the home. Alcohol consumption and AUDIT scores ≥8 points were associated with AHTO from fathers, friends and strangers. AHTO in the home profoundly affected a higher proportion of people than that outside the home. Moreover, a higher proportion of women than men reported being profoundly affected both in and outside the home.

4.1 | Frequency of AHTO in Japan

The lifetime proportion of adults (men/women) who experienced AHTO is reported to be 85%/83% in New Zealand, and the 12-month proportion was 50.1%–73.8%/46.6%–72.4% in Asian countries, 53.1%/46.7% in the United States, 23.0%/20.8% in Sweden and 4.8%/3.9% in South Korea [13, 15, 22–24]. The results are not directly comparable because of the different timeframes, ways of assessing types of harm, and ages of the participants; however, according to this study, AHTO in Japan was lower than in other countries. This may be because the types of harm in this study did not include 'awake at night' and 'been a passenger with a driver who had too much to drink', and the responses focused on tangible harm [6, 7]. The frequency of tangible harm in the last 12 months in nine countries ranged from 12.5% in Nigeria to 49.7% in India, and the present results were also within this range [7]. South Korea also has a lower frequency of AHTO than other countries [23]. Considering the low frequency of AHTO in Japan compared to the lifetime proportion in New Zealand, it may not be regarded as harmful in East Asia [22]. Although East Asian countries do not share similar drinking patterns, there are cultural similarities, such as respect for superiors, and this may be one of the reasons that despite having experienced AHTO from superiors, they do not entertain the idea of it being harmful [25].

4.2 | Differences in the background factors of AHTO according to the relationship with the drinker

The finding that AHTO in the home was more common in women corresponds with that of previous studies [13–15]. However, according to the findings of this study, no difference exists between men and women regarding AHTO from fathers in the home. AHTO from the father can be experienced by their children regardless of gender. Whereas AHTO from spouses was common in women. This may be because men in Japan typically drink at higher rates and in greater quantities than women [26]. The other factors associated with AHTO in the home, from fathers and spouses, were completely different. Experiencing AHTO from the father was associated with the respondent's drinking habits or an AUDIT score of 8 or higher, but no association was detected for AHTO from the spouse. AHTO from fathers occurs only among those who have a father with a drinking habit. Thus, these results may indicate an association between fathers' drinking behaviour and their own drinking behaviour, as shown in a previous study [27]. Alcohol dehydrogenase enzymes degenerate ethanol to acetaldehyde, which subsequently degenerates to acetate through the action of aldehyde dehydrogenase 2 (ALDH2) enzymes. The ALDH2 variant ALDH2*504Lys has low ALDH2 activity, and the elevation of acetaldehyde levels causes discomfort. Hence, individuals with the ALDH2*504Lys allele find it easy to avoid excessive alcohol consumption [28]. About 10% to 30% of all Japanese individuals have the ALDH2*504Lys allele, and hence, it is considered that a number of families exist in which the father does not drink [29]. AHTO from spouses was mostly experienced by women in Japan, and the OR of divorced and widowed status was higher, suggesting that AHTO from spouses was associated with divorce. In Japan, AHTO from spouses was not related to respondents' problem drinking. This finding is in line with a previous Japanese study about the domestic violence associated with

victims' drinking [10]. In recent years, a downward trend has been observed in the rate of drinking among men, and a reduction in the rate of drinking is hoped to decrease AHTO in the home [26].

The factors related to the experience of AHTO outside the home were different according to the relationships with the drinker. AHTO from co-workers was more likely to be experienced by men and those who were young, and respondents' drinking and problem drinking were not associated. In Japan, drinking with colleagues is an important form of socialisation, and occasional heavy drinking is likely to occur [30]. Even non-drinkers cannot avoid attending such drinking parties; therefore, AHTO from a co-worker is likely regardless of drinking status. AHTO from friends and strangers were higher among drinkers and those with an AUDIT score of ≥8 points. This may be because the more often people drink in pubs and bars, the more likely they are to experience AHTO, possibly because they are surrounded by people who are drinking [31]. Non-drinkers were less likely to experience AHTO in public places than in other countries [24]. AHTO from co-workers can be reduced by establishing ways of socialising without drinking in Japan. Some companies are taking initiatives to replace post-work drinking sessions with lunch or teatime.

4.3 | Differences in the impact of AHTO in and outside the home on respondents

The proportion of those who were profoundly affected was higher for AHTO inside than outside the home. The number of AHTO experiences, feeling threatened or afraid, or financial problems due to family, spousal or partner drinking was reported to be associated with distress [17, 18].

Sexual harassment is a greater factor in mental distress than threats or violence in the workplace [32]. In this study, a higher proportion of women were subjected to sexual harassment by co-workers and reported that it had profoundly affected them, which may have influenced the gender difference in the impact of AHTO.

4.4 | Limitations

The study has some limitations. First, even standardised AHTO items may be interpreted differently in different cultural and linguistic contexts, and the appropriateness of the items may require further investigation [6, 7, 33]. Additionally, as we assessed the lifetime experience of AHTO, the responses may have focused on certain categories more strongly remembered, especially tangible harm. Therefore, it may be difficult to compare the results with those of studies conducted with a focus on AHTO occurring in the previous 12 months. Second, the survey was a self-report. Although it was a face-to-face survey, the respondents were asked to point to their answers. Thus, it depended on the individual's perception of victimisation in the context of AHTO [33]. Third, the cross-sectional study design does not allow the verification of the causal effects of socio-demographic and risk factors. Estimating causality requires longitudinal studies, which are costly and time-consuming. Owing to these limitations, the frequency of AHTO identified here is the frequency that respondents were able to recognise among the AHTO presented. Therefore, if more comprehensive or unrecognised AHTO were included, the frequency could be much higher.

5 | CONCLUSIONS

The lifetime experience of AHTO in Japan was 24.7% for men and 19.3% for women. AHTO from the spouse in the home and co-workers outside the home were experienced regardless of the respondents' drinking patterns. Continued monitoring of AHTO ensures that the public and government have an accurate understanding of its status. Additionally, measures aimed at reducing alcohol-related harm that include AHTO should be promoted.

AUTHOR CONTRIBUTIONS

Aya Kinjo, Ruriko Minobe, Hitoshi Maesato, Yoneatsu Osaki and Susumu Higuchi planned the study design and collected the data. Aya Kinjo, Tomomi Okada, Ko Shimogawa and Yoneatsu Osaki analysed the data and prepared the first draft of the manuscript. Yuki Kuwabara, Maya Fujii, Susumu Higuchi and Yoneatsu Osaki reviewed all the drafts and helped prepare the final manuscript.

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CONFLICT OF INTEREST

None to declare.

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REFERENCES

1. GBD 2019 Risk Factors Collaborators. Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the global burden of disease study 2019. Lancet. 2020;396:1223–49.
2. Rehm J, Gmel GE Sr, Gmel G, Hasan OSM, Imtiaz S, Popova S, et al. The relationship between different dimensions of alcohol use and the burden of disease-an update. Addiction. 2017;112:968–1001.
3. Ferris JA, Laslett AM, Livingston M, Room R, Wilkinson C. The impacts of others' drinking on mental health. Med J Aust. 2011;195:S22–6.
4. Laslett AM, Room R, Ferris J, Wilkinson C, Livingston M, Mugavin J. Surveying the range and magnitude of alcohol's harm to others in Australia. Addiction. 2011;106:1603–11.
5. Navarro HJ, Doran CM, Shakeshaft AP. Measuring costs of alcohol harm to others: a review of the literature. Drug Alcohol Depend. 2011;114:87–99.
6. Grittner U, Bloomfield K, Kuntsche S, Callinan S, Stanesby O, Gmel G. Improving measurement of harms from others' drinking: using item-response theory to scale harms from others' heavy drinking in 10 countries. Drug Alcohol Rev. 2021;41:577–87.
7. Laslett AM, Room R, Waleewong O, Stanesby O, Callinan S, editors. Harm to others from drinking: patterns in nine societies. Geneve: World Health Organization; 2019. Licence: CC BY-NC-SA 3.0 IGO; 2019. [cited 22 March 2022]. Available from: https://apps.who.int/iris/handle/10665/329393
8. Room R, Ferris J, Laslett AM, Livingston M, Mugavin J, Wilkinson C. The drinker's effect on the social environment: a conceptual framework for studying alcohol's harm to others. Int J Environ Res Public Health. 2010;7:1855–71.
9. Shimizu S, Kim DS, Hirota M. Drinking practice and alcohol-related problems: the national representative sample survey for healthy Japan 21. Nihon Arukoru Yakubutsu Igakkai Zasshi. 2004;39:189–206.
10. Shimizu S, Kim DS, Hirota M. Domestic violence in relevance with drinking problems: the Japanese national survey. Nihon Arukoru Yakubutsu Igakkai Zasshi. 2005;40:80–94.
11. ASK. The number of deaths caused by acute alcohol poisoning since 1983. [cited 22 March 2022]. Available from: https://www.ask.or.jp/article/539.
12. Karriker-Jaffe KJ, Greenfield TK. Gender differences in associations of neighbourhood disadvantage with alcohol's harms to others: a cross-sectional study from the USA. Drug Alcohol Rev. 2014;33:296–303.
13. Nayak MB, Patterson D, Wilsnack SC, Karriker-Jaffe KJ, Greenfield TK. Alcohol's secondhand harms in the United States: new data on prevalence and risk factors. J Stud Alcohol Drugs. 2019;80:273–81.
14. Stanesby O, Callinan S, Graham K, Wilson IM, Greenfield TK, Wilsnack SC, et al. Harm from known others' drinking by relationship proximity to the harmful drinker and gender: a meta-analysis across 10 countries. Alcohol Clin Exp Res. 2018;42:1693–703.
15. Sundin E, Galanti MR, Landberg J, Ramstedt M. Severe harm from others' drinking: a population-based study on sex differences and the role of one's own drinking habits. Drug Alcohol Rev. 2021;40:263–71.
16. Greenfield TK, Ye Y, Kerr W, Bond J, Rehm J, Giesbrecht N. Externalities from alcohol consumption in the 2005 US national alcohol survey: implications for policy. Int J Environ Res Public Health. 2009;6:3205–24.
17. Karriker-Jaffe KJ, Greenfield TK, Kaplan LM. Distress and alcohol-related harms from intimates, friends, and strangers. J Subst Use. 2017;22:434–41.
18. Karriker-Jaffe KJ, Li L, Greenfield TK. Estimating mental health impacts of alcohol's harms from other drinkers: using propensity scoring methods with national cross-sectional data from the United States. Addiction. 2018;113:1826–39.
19. Ministry of Health, Labour, and Welfare. Income and other information for various households. 2017. [cited 22 March 2022]. Available from: https://www.mhlw.go.jp/toukei/saikin/hw/k-tyosa/k-tyosa17/dl/03.pdf.
20. Babor TF, Higgins-Biddle JC, Saunders JB, Monteiro MG. AUDIT: the alcohol use disorders identification test guidelines for use in primary care. 2nd ed. Geneva: World Health Organization; 2001.
21. Kinjo A, Kuwabara Y, Fujii M, Imamoto A, Osaki Y, Minobe R, et al. Heated tobacco product smokers in Japan identified by a population-based survey. J Epidemiol. 2020;30:547–55.
22. Casswell S, Harding JF, You RQ, Huckle T. Alcohol's harm to others: self-reports from a representative sample of New Zealanders. N Z Med J. 2011;124:75–84.
23. Eum MJ, Choi MJ. Association between exposure to alcohol's harm to others and health-related quality of life in Korean adults: a nationwide population-based study. Int J Environ Res Public Health. 2021;18:2714.
24. Waleewong O, Laslett AM, Chenhall R, Room R. Harm from others' drinking-related aggression, violence and misconduct in five Asian countries and the implications. Int J Drug Policy. 2018;56:101–7.
25. World Health Organization. Global status report on alcohol and health 2018. Geneva: World Health Organization; 2018.
26. Osaki Y, Kinjo A, Higuchi S, Matsumoto H, Yuzuriha T, Horie Y, et al. Prevalence and trends in alcohol dependence and alcohol use disorders in Japanese adults; results from periodical nationwide surveys. Alcohol. 2016;51:465–73.
27. Kinjo A, Kuwabara Y, Minobe R, Maezato H, Kimura M, Higuchi S, et al. Different socioeconomic backgrounds between hazardous drinking and heavy episodic drinking: prevalence by sociodemographic factors in a Japanese general sample. Drug Alcohol Depend. 2018;193:55–62.
28. Eriksson CJ. The role of acetaldehyde in the actions of alcohol (update 2000). Alcohol Clin Exp Res. 2001;25(5 Suppl ISBRA):15 S–32 S.
29. Li H, Borinskaya S, Yoshimura K, Kal'ina N, Marusin A, Stepanov VA, et al. Refined geographic distribution of the oriental ALDH2*504Lys (nee 487Lys) variant. Ann Hum Genet. 2009;73:335–45.

30. Ikeda A, Kawachi I, Iso H, Inoue M, Tsugane S, JPHC Study Group. Gender difference in the association between social support and metabolic syndrome in Japan: the 'enkai' effect? J Epidemiol Community Health. 2011;65:71–7.
31. Moan IS, Brunborg GS. Alcohol's harm to others: does the drinking location matter? Subst Use Misuse. 2021;56: 1421–7.
32. Sterud T, Hanvold TN. Effects of adverse social behaviour at the workplace on subsequent mental distress: a 3-year prospective study of the general working population in Norway. Int Arch Occup Environ Health. 2021;94:325–34.
33. Room R, Laslett A-M, Jiang H. Conceptual and methodological issues in studying alcohol's harm to others. Nordic Stud Alcohol Drugs. 2016;33:455–78.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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