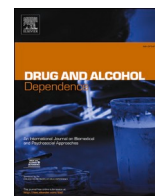




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Binge drinking in Japan during the COVID-19 pandemic: Prevalence, correlates and association with preventive behaviors

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ARTICLE INFO

Keywords:
Alcohol
Coronavirus
Heavy drinking
Public health

ABSTRACT

Background: There is some evidence that alcohol use may have changed during the coronavirus pandemic. However, as yet, there has been comparatively little focus on heavy/excessive drinking. This study examined binge drinking (BD) in Japan during the coronavirus pandemic and its association with COVID-19 preventive behaviors.

Method: Data were analyzed from an online sample of 1452 individuals aged 18 and above that were collected one year after the beginning of the pandemic. Self-reported information was obtained on current and pre-pandemic BD and a range of sociodemographic and health-related variables. Logistic regression analysis was used to examine associations.

Results: Just under one-third of the sample (29.3%) reported past-month BD. More individuals reduced rather than increased BD during the pandemic (11.5% > 6.5%). Worsening household finances and depressive symptoms were associated with both current and increased BD, while young age (18–29) was linked to both increased and decreased BD. Individuals who binged had significantly lower odds for engaging in several COVID-19 preventive behaviors including wearing a mask (odds ratio [OR]: 0.47, 95% confidence interval [CI]: 0.30–0.76), hand washing (OR: 0.58, 95%CI: 0.44–0.76) and avoiding crowds/staying at home (OR: 0.72, 95%CI: 0.55–0.93).

Conclusion: BD is prevalent in Japan during the coronavirus pandemic and associated with poorer adherence to COVID-19 preventive behaviors. Increasing public awareness of the potentially detrimental effects of heavy alcohol use during the ongoing pandemic is now a public health priority.

1. Introduction

Binge drinking (BD) refers to the consumption of a large volume of alcohol (heavy drinking) in a short period of time (Gmel et al., 2003) that leads to intoxication (Herring et al., 2008). This pattern of alcohol consumption – which is also termed heavy episodic drinking (HED) (Herring et al., 2008) – is prevalent in many societies, with a recent report from the World Health Organization (WHO) showing that the worldwide prevalence of BD (HED) was 39.5% among drinkers aged 15 and above in 2016 (World Health Organization, 2018). This situation is worrying given that BD has been linked to a variety of negative health outcomes such as alcohol poisoning, unintentional/intentional injuries, and sexually transmitted diseases (Kuntsche et al., 2017), and may also detrimentally affect different body organs such as the liver and brain

(Llerena et al., 2015).

This study will examine BD in Japan during the coronavirus pandemic and its association with COVID-19 preventive behaviors. In the early phase of the pandemic it was speculated that the spread of coronavirus might be associated with a growth in alcohol misuse given that measures intended to prevent COVID-19 infection such as self-isolation, quarantining and associated changes in home and work life were likely to be highly stressful and that stress is a major risk factor for alcohol misuse (Clay and Parker, 2020; Zvolensky et al., 2020). However, although a study from May 2020 found that past 30-day BD was widespread among U.S. adult drinkers (34.1%) (Grossman et al., 2020), and other research reported an increase in BD in the early pandemic period (April to June 2020) (Barbosa et al., 2021; Niedzwiedz et al., 2021; Pollard et al., 2020; Winkler et al., 2020), other studies showed a

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<https://doi.org/10.1016/j.drugalcdep.2022.109415>

Received 3 November 2021; Received in revised form 8 March 2022; Accepted 14 March 2022

Available online 21 March 2022

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decrease in BD during the period from April to July 2020 (Ammar et al., 2020; Boschuetz et al., 2020; Kilian et al., 2021). Some research has highlighted the potential complexity of this situation by showing that among individuals in the same sample, some reported an increase in BD during the pandemic while others engaged in less BD (Busse et al., 2021; Valente et al., 2021).

These mixed findings may indicate that different mechanisms could underlie both increased or decreased alcohol use (and/or BD) during the coronavirus pandemic. For example, in line with an idea that has emerged from a social learning theory perspective on alcohol abuse, it is possible that increased alcohol consumption/BD might reflect its use as an individual coping mechanism i.e. as a way to avoid, escape or regulate stress or other negative emotions (Cooper et al., 1988; Holahan et al., 2001) during the coronavirus pandemic. Support for this supposition comes from an earlier study which linked drinking to cope with BD (drinking to intoxication) (Tyssen et al., 1998) and from a recent review study which has suggested that increased alcohol consumption may be one way of coping during the pandemic (Xu et al., 2021). Alternatively, from the perspective of the theory of planned behavior (Ajzen, 1991, 2002) it can be speculated that factors that have been previously linked to BD such as self-efficacy, perceived control and BD intention (Norman, 2011; Norman and Conner, 2006; Woolfson and Maguire, 2010) may have been affected during the pandemic. Specifically, Covid-19-related preventive policies (e.g. lockdowns) and their effects (e.g. work-related changes such as job loss/reduced working hours/fewer social gatherings; the closure of bars/restaurants), may have resulted in reduced opportunities to engage in BD.

Regarding our study setting, after coronavirus cases began to rise rapidly in February 2020, Japan experienced three distinct waves of infection during the first year of the pandemic (Karako et al., 2021). Various measures were instituted to prevent the spread of COVID-19 including the declaration of a state of emergency in April to May 2020 and again in January 2021 (Looi, 2021). These were associated with requests that residents refrain from going out, with some bars and restaurants closing while others reduced their working hours – for which they were financially compensated (Savor Japan, 2020). Across this whole period overall spending on alcohol fell but household expenditure on alcohol increased as more people drank at home (Nippon.com, 2021). Against this backdrop, addiction medicine specialists have reported that BD cases have increased in Japan during the pandemic (Calvey et al., 2020). This may have important public health implications not only because the prevalence of BD was already high in Japan before the coronavirus pandemic began (Bergmark and Kuendig, 2008; World Health Organization, 2018) but also because recent research from other countries has shown that increased alcohol consumption (Ebrahimi et al., 2021), BD (Einberger et al., 2021; Suffoletto et al., 2020) and alcohol abuse (Taylor et al., 2021) are all linked to non-compliance with COVID-19 preventive measures. Together with other research that has linked alcohol consumption to symptomatic (vs. asymptomatic) COVID-19 infection (Saurabh et al., 2021), SARS-CoV-2 seropositivity and a self-reported infection history (Kianersi et al., 2021) and an increased risk for developing acute respiratory distress syndrome (ARDS) when hospitalized for COVID-19 (Lassen et al., 2021), this highlights the importance of research focused on alcohol use and misuse during the COVID-19 pandemic.

Thus, the main aims of this study are to (1) determine the prevalence of BD and factors associated with BD in Japan during the COVID-19 pandemic; (2) examine changes in the prevalence of BD during the pandemic and what factors are linked to increased or decreased BD; (3) assess whether BD is associated with COVID-19 preventive behaviors.

2. Methods

2.1. Study participants

The data came from an online survey undertaken among the

Japanese general public over a two-day period in late February, 2021. Macromill, a commercial survey company that was in charge of the survey's administration, initially sent a questionnaire to 8628 respondents who were part of its online commercial web panel. The survey was subsequently sent to a second batch of 1728 individuals. Respondents came from every Japanese prefecture and were chosen using a 16-cell (age x sex) selection procedure. The final sample consisted of 1452 respondents aged 18 and above. The Ethics Committee at the National Center of Neurology and Psychiatry, Tokyo, Japan provided approval for the survey (approval number: A2020–088). All participants provided informed consent for their participation.

2.2. Measures

2.2.1. Binge drinking

The prevalence of BD was assessed with a question asking, "During the past month, how often did you have 5 or more (males) or 4 or more (females) drinks containing any kind of alcohol within a two-hour period?" There were eight possible response options: (i) every day (ii) 5–6 days a week (iii) 3–4 days a week (iv) 2 days a week (v) 1 day a week (vi) 2–3 days a month (vii) 1 day a month (viii) on no days in the month. A second question, using the same wording and response options was then used to assess BD in the pre-pandemic period, beginning with the prompt, "During the month before the coronavirus pandemic began..." This BD question was adapted from one of the recommended alcohol questions on the website of the United States National Institute on Alcohol Abuse and Alcoholism (National Institute on Alcohol Abuse and Alcoholism, 2020). The use of five or more drinks for males and four or more drinks for females has a long history in BD research (Wechsler et al., 1995). This measure has also been used recently in studies assessing BD in college students in Japan (Kawaida et al., 2018b; 2021). In Japan, as a standard drink has been considered to contain 10 g of pure alcohol in recent years (International Alliance for Responsible Drinking, 2019), in this study BD referred to consuming ≥ 50 g of alcohol for men and ≥ 40 g of alcohol for women in a two-hour period (Kawaida et al., 2021).

2.2.2. COVID-19 preventive behaviors

Information was obtained on a variety of COVID-19 preventive behaviors (listed in Table 4). These measures included various social distancing behaviors (e.g. keeping a distance of two meters from people when outside; avoid engaging in gatherings/parties etc.), as well as standard hygiene procedures that have been promoted to help prevent the spread of coronavirus (e.g. washing/disinfecting hands, wearing a mask; etc.) (World Health Organization, 2019). Respondents were asked to indicate which of these behaviors they engaged in during the pandemic. These items have been used previously in Japan to assess factors associated with preventive behavior during the COVID-19 pandemic (Stickley et al., 2020, 2021).

2.2.3. Correlates

Previous research was used as a guide when selecting variables to examine as possible correlates of BD (Haque et al., 2021). Information was obtained on the respondents' sex (male, female) and age, which was divided into six categories (18–29, 30–39, 40–49, 50–59, 60–69 and ≥ 70). Two categories were used to classify education – higher education (2-year college, university, graduate school) and less than higher education (junior high school/below, high school, vocational high school). Marital status was also dichotomized: married or not married. Five groups were used to categorize job status: (i) outside the job market (homemakers, students, others), (ii) employed (government, company employees in different sectors), (iii) self-employed/freelance, (iv) part-time employment, (v) non-employed. Household financial income was reported in millions of yen (JPY) and assessed using three categories, (i) < 4 million, (ii) $4 < 10$ million, and (iii) ≥ 10 million (106.55 JPY = U.S. \$1 at the time of the survey). As a large number of

participants refused to answer this question (22.7%), a fourth (iv) 'missing' category was also created in order to maximize the number of respondents included in the analysis. To assess how the pandemic had affected each respondent's household finances they were asked, "How has your household's economic situation changed in the past year?" Responses were grouped into three categories: (i) unchanged, (ii) improved, (iii) worsened. Self-rated health (SRH) was categorized as 'good/very good', 'fair' and 'poor/very poor'. Mental health was assessed with two measures. The self-report Patient Health Questionnaire (PHQ-9) was used to assess past two-week depressive symptoms (Spitzer et al., 1999). This 9-item scale produces a total score between 0 and 27 where higher scores indicate more depressive symptoms. Following the lead of earlier research, in the current study a score of ≥ 10 was used to categorize depressive symptoms (Levis et al., 2019). This scale has been validated previously in Japan (Muramatsu et al., 2018). The self-report 7-item Generalized Anxiety Disorder scale (GAD-7) was used to assess past two-week anxiety symptoms (Spitzer et al., 2006). The scale's total score ranges between 0 and 21 with higher scores indicating greater anxiety, with a score of ≥ 10 being used to categorize at least a moderate level of anxiety in this study (Spitzer et al., 2006). This scale has also been previously validated in Japan (Muramatsu et al., 2010). Finally, perceived stress was assessed with the Perceived Stress Scale (PSS-14) (Cohen et al., 1983). This 14-item self-report scale produces a total score between 0 and 56 with higher scores indicating a higher level of past-month stress. The scale has been validated in numerous countries including Japan (Mimura and Griffiths, 2004).

2.3. Statistical analysis

Descriptive statistics of the study sample stratified by BD status were first calculated with Chi-square and Mann-Whitney U tests used to assess differences. Next, logistic regression was used to examine what factors are associated with BD in Japan during the COVID-19 pandemic. Two analyses were performed. In the first analysis the bivariate association was examined between each of the individual factors and BD. In the second analysis all the variables were included together in a multivariable model. Logistic regression using the same bivariate and multivariable analyses was then used to examine what factors are associated with increased or decreased BD during the COVID-19 pandemic. When examining increased BD those who experienced a decrease in BD were removed from the analysis (i.e. so that individuals who experienced increased BD were compared to those whose BD frequency remained unchanged) and vice versa for decreased BD. Logistic regression was next used to examine the association between BD and COVID-19 preventive behaviors. Four analytic models were used. Model 1 examined the bivariate association between BD and the individual preventive behaviors. Model 2 included sociodemographic and SRH variables. Model 3 included the same variables as in Model 2 and mental health variables (anxiety and depressive symptoms) that have been previously linked to preventive behaviors in Japan (Stickle et al., 2020). Model 4 included the same variables as in Model 3 and perceived stress (examined as a continuous score).

All analyses were performed with the Statistical Package for the Social Sciences (SPSS) version 22.0. As regional drinking customs may vary across Japan with implications for harmful alcohol use (Sugiyama et al., 2021) the multivariable analyses were also adjusted for region. Results are presented as odds ratios (OR) with 95% confidence intervals (CI). A p-value of < 0.05 (two-tailed) indicates statistically significant results.

3. Results

The average age of the respondents was 51.6 years (range 18–89), with the majority being female (51.5%). Almost two-thirds of the respondents were married (61.3%) and had received a higher education (64.5%). Most respondents had a family income in the 4 to < 10 million

yen range (41.3%). In terms of health outcomes, 10.7% of the respondents had poor/very poor SRH, while 17.0% and 10.8% had depressive and anxiety symptoms, respectively. Just under one-third (29.3% [426/1452]) of the respondents engaged in past-month BD, with BD being more prevalent in men than women (40.6% $>$ 18.7%). More respondents reported a decrease than an increase in BD during the pandemic (11.5% $>$ 6.5%). Among those who reported a decrease in BD the majority were occasional drinkers (BD less than once a week) that stopped engaging in this form of alcohol consumption (65.3% [109/167]).

When the sample was stratified by BD status, being male, middle-aged, highly educated, married, fully employed, having a high income, changed financial situation in the past year, and depressive and anxiety symptoms were all associated with a higher prevalence of BD (Table 1). In bivariate analyses all of the individual factors except SRH and perceived stress were significantly associated with current BD in Japan during the COVID-19 pandemic (Table 2). However, in the multivariable analysis most of the associations were fully attenuated. Female sex, not being married and being non-employed were associated with significantly reduced odds for current BD whereas a deteriorating household financial situation and depressive symptoms were associated with significantly increased odds for BD.

In multivariable analyses being in the youngest age group (18–29)

Table 1
Sample characteristics by binge drinking (BD) status.

	Total N	No BD (%)	BD (%)	P-value
Sex				<0.001
Male	704	59.4	40.6	
Female	748	81.3	18.7	
Age				.001
18–29	207	70.5	29.5	
30–39	218	68.3	31.7	
40–49	254	62.2	37.8	
50–59	215	67.9	32.1	
60–69	251	73.7	26.3	
≥ 70	307	78.8	21.2	
Education				.021
<Higher education	515	74.4	25.6	
Higher education	937	68.6	31.4	
Marital status				.019
Not married	562	74.2	25.8	
Married	890	68.4	31.6	
Job status				<0.001
Outside job market	433	79.7	20.3	
Employed (company etc.)	540	58.5	41.5	
Self-employed/freelance	79	59.5	40.5	
Part-time employment	183	78.1	21.9	
Non-employed	217	80.6	19.4	
Household income (Yen)				<0.001
< 4 million	415	76.4	23.6	
4 million to < 10 million	599	66.4	33.6	
≥ 10 million	109	59.6	40.4	
Missing data	329	74.8	25.2	
Household finances				<0.001
Unchanged	805	75.2	24.8	
Improved	44	61.4	38.6	
Worsened	555	64.1	35.9	
Missing data	48	79.2	20.8	
Self-rated health				.950
Poor/very poor	155	71.6	28.4	
Fair	586	70.3	29.7	
Good/very good	698	70.5	29.5	
Depressive symptoms				<0.001
No	1205	73.2	26.8	
Yes	247	58.3	41.7	
Anxiety symptoms				.003
No	1295	71.9	28.1	
Yes	157	60.5	39.5	
Perceived stress (M [SD])	1452	27.0 [8.3]	27.6 [7.3]	.159

M: Mean; SD: Standard deviation

Table 2
Factors associated with current binge drinking in Japan during the COVID-19 pandemic[‡].

	Bivariate analysis OR (95%CI)	Multivariable analysis [†] OR (95%CI)
Sex (Female)	0.34 (0.27–0.43)***	0.34 (0.25–0.45)***
Age		
≥ 70	Ref.	Ref.
18–29	1.56 (1.04–2.33)*	1.10 (0.64–1.89)
30–39	1.72 (1.16–2.56)**	1.01 (0.61–1.67)
40–49	2.26 (1.56–3.29)***	1.41 (0.87–2.27)
50–59	1.76 (1.18–2.62)**	1.10 (0.67–1.79)
60–69	1.33 (0.90–1.97)	0.96 (0.62–1.49)
Education		
<Higher education	0.75 (0.59–0.96)*	0.94 (0.72–1.22)
Marital status		
Not married	0.75 (0.60–0.95)*	0.65 (0.48–0.88)**
Job status		
Outside job market	Ref.	Ref.
Employed (company etc.)	2.78 (2.08–3.71)***	1.38 (0.95–2.00)
Self-employed/freelance	2.67 (1.61–4.43)***	1.36 (0.77–2.39)
Part-time employment	1.10 (0.72–1.67)	0.95 (0.61–1.49)
Non-employed	0.94 (0.62–1.42)	0.58 (0.36–0.94)*
Household income (Yen)		
≥ 10 million	Ref.	Ref.
< 4 million	0.46 (0.29–0.71)**	0.77 (0.46–1.29)
4 million to < 10 million	0.75 (0.49–1.13)	0.91 (0.57–1.44)
Missing data	0.50 (0.32–0.79)**	0.82 (0.49–1.38)
Household finances		
Unchanged	Ref.	Ref.
Improved	1.91 (1.02–3.57)*	1.57 (0.80–3.08)
Worsened	1.69 (1.34–2.14)***	1.55 (1.19–2.03)**
Missing data	0.80 (0.39–1.63)	1.00 (0.45–2.24)
Self-rated health [†]		
Good/very good	Ref.	Ref.
Fair	1.01 (0.79–1.28)	0.96 (0.73–1.26)
Poor/very poor	0.95 (0.64–1.39)	0.84 (0.54–1.32)
Depressive symptoms	1.95 (1.47–2.59)***	2.18 (1.45–3.27)***
Anxiety symptoms	1.67 (1.19–2.35)**	1.12 (0.69–1.80)
Perceived stress	1.01 (1.00–1.02)	0.98 (0.97–1.00)

[‡]Analyses were undertaken with 1452 respondents unless otherwise stated

[†]Analysis was undertaken with 1439 respondents

OR: Odds ratio; CI: Confidence interval; Ref: Reference category

*** p < .001, ** p < .01, * p < .05

Multivariable analysis was adjusted for region

was associated with significantly higher odds for both increased and decreased BD during the COVID-19 pandemic, while fair SRH was associated with significantly reduced odds for increased and decreased binge drinking (Table 3). A worse household financial situation was associated with 69% higher odds for increased BD (OR: 1.69, 95%CI: 1.05–2.70) while having depressive symptoms doubled the odds for increased BD (OR: 1.99, 95%CI: 1.02–3.89). Other predictors of decreased BD included being employed and in the 50–59 age group which both had over two times higher odds for reduced drinking whereas having poor/very poor SRH was associated with significantly reduced odds for BD (OR: 0.41, 95%CI: 0.20–0.82).

In the bivariate analysis (Model 1) BD was associated with reduced odds for engaging in all of the COVID-19 preventive behaviors except one, and seven of these associations were statistically significant with ORs ranging from 0.43 for wearing a mask to 0.79 for using a tissue/sleeve when coughing/sneezing (Table 4). Adjusting for sociodemographic factors and SRH (Model 2) fully attenuated some of these associations although further adjustment for mental health (Model 3) and perceived stress (Model 4) had little effect. In the fully adjusted Model 4 BD was associated with significantly reduced odds for four of the preventive behaviors: washing hands, wearing a mask, avoid face touching and avoiding crowds/staying at home.

4. Discussion

This study used data from 1452 Japanese individuals aged 18 and above that were collected one year after the start of the coronavirus pandemic to examine BD and the factors associated with it. BD was prevalent in the sample with almost one in three adults reporting this form of monthly alcohol consumption, although more individuals reported decreased rather than increased BD during the pandemic. Results from logistic regression analyses showed that different factors were associated with current, increased and decreased BD although there were factors that were common across categories such as a worsening household financial situation and depressive symptoms, which were linked to both current and increased BD. In fully adjusted analyses BD was associated with significantly lower odds for engaging in several COVID-19 preventive behaviors such as wearing a mask and avoiding crowds.

There has been comparatively little research on BD in Japan and previous studies have produced different prevalence estimates depending on the specific population being studied and how BD has been defined. A recent study among Japanese college students that used the same definition of BD as in this study showed that the prevalence of BD was high among both men (55.7%) and women drinkers (46.2%) (Kawaida et al., 2021). In contrast, a study that used nationwide data from three cross-sectional surveys undertaken in Japan in 2003, 2008 and 2013 found that the age-adjusted prevalence for the total population ranged between 4.5% and 6.4% when BD was defined as consuming 60 g or more of alcohol on one drinking occasion, one or more times a week. However, when information was also collected on HED (i.e. consuming 60 g or more of alcohol on one drinking occasion over the previous 30 days) in the 2013 wave, the prevalence was much higher – 17.4% (Osaki et al., 2016). In an earlier cross-country study which defined BD as consuming five or more drinks on the same occasion per month or more often, Japanese men ranked first among eight countries that provided data with a prevalence of 75.0%, while Japanese women ranked fifth with a prevalence of 39.2%. Although the Japanese sample was limited to adults aged 20–69 (N = 2254) the authors nevertheless concluded that the prevalence of BD was high in Japan (Bergmark and Kuendig, 2008). This is in line with the results of the current study as we found that 40.6% of Japanese men and 18.7% of Japanese women engaged in BD. Given that BD has been linked to a range of detrimental health and social outcomes, the findings of this study suggest that a renewed focus should be placed on hazardous alcohol use in the Japanese general population.

More respondents reported a decrease rather than an increase in BD during the first year of the pandemic. Research undertaken during the first months after the emergence and spread of coronavirus produced mixed results with some studies reporting reduced BD (Ammar et al., 2020; Boschuetz et al., 2020), while other studies noted an increase in the prevalence of BD (Barbosa et al., 2021; Niedzwiedz et al., 2021; Pollard et al., 2020; Winkler et al., 2020). Interestingly, our analyses indicated that while there were factors that were specific to the different BD outcomes we examined, some factors were associated with more than one of the outcomes (i.e. current, increased, reduced BD). For example, female sex, not being married and being non-employed were all linked to reduced odds for current BD but not to changes in BD. The finding that men are more likely to engage in BD is common among adults across countries (Kuntsche et al., 2017), while a recent pre-pandemic study linked being unmarried (men only) and non-employed to lower odds for HED among a national sample of Japanese adults aged 20–64 (Kinjo et al., 2018).

Worsening household finances and depressive symptoms were associated with significantly higher odds for both current and increased BD. A recent review reported that there is a relation between BD and depression (Lannoy et al., 2021) and depression has been linked to both BD (Verma and Mishra, 2020) and increased BD (Busse et al., 2021) during the COVID-19 pandemic. It has been suggested that substances,

Table 3
Factors associated with changes in the frequency of binge drinking in Japan during the COVID-19 pandemic.

	Increased binge drinking		Decreased binge drinking	
	Bivariate analysis [‡] OR (95%CI)	Multivariable analysis [‡] OR (95%CI)	Bivariate analysis [‡] OR (95%CI)	Multivariable analysis [‡] OR (95%CI)
Sex (Female)	0.72 (0.47–1.09)	0.78 (0.47–1.29)	0.58 (0.42–0.81)**	0.77 (0.52–1.13)
Age				
≥ 70	Ref.	Ref.	Ref.	Ref.
18–29	3.05 (1.53–6.07)**	2.93 (1.17–7.31)*	2.54 (1.41–4.59)**	2.56 (1.19–5.51)*
30–39	0.84 (0.34–2.03)	0.56 (0.20–1.53)	1.67 (0.90–3.09)	1.12 (0.52–2.39)
40–49	1.42 (0.67–3.00)	1.06 (0.44–2.55)	2.08 (1.17–3.69)**	1.45 (0.71–2.96)
50–59	1.88 (0.90–3.96)	1.39 (0.58–3.35)	2.67 (1.50–4.75)**	2.04 (1.01–4.16)*
60–69	1.68 (0.82–3.46)	1.38 (0.64–3.00)	1.56 (0.85–2.86)	1.36 (0.70–2.64)
Education				
<Higher education	0.78 (0.50–1.23)	0.95 (0.59–1.54)	0.61 (0.42–0.87)**	0.78 (0.53–1.15)
Marital status				
Not married	0.83 (0.53–1.28)	0.59 (0.34–1.03)	0.94 (0.67–1.31)	0.84 (0.56–1.27)
Job status				
Outside job market	Ref.	Ref.	Ref.	Ref.
Employed (company etc.)	1.55 (0.93–2.57)	1.29 (0.69–2.44)	3.00 (1.93–4.66)***	2.45 (1.44–4.17)**
Self-employed/freelance	1.88 (0.81–4.33)	1.59 (0.63–4.00)	1.89 (0.86–4.19)	1.84 (0.79–4.30)
Part-time employment	0.92 (0.43–1.95)	0.96 (0.44–2.11)	1.24 (0.65–2.37)	1.32 (0.67–2.60)
Non-employed	0.62 (0.28–1.39)	0.70 (0.28–1.75)	1.46 (0.81–2.62)	1.90 (0.96–3.76)
Household income (Yen)				
≥ 10 million	Ref.	Ref.	Ref.	Ref.
< 4 million	0.58 (0.26–1.29)	0.85 (0.35–2.10)	0.32 (0.18–0.57)***	0.55 (0.28–1.08)
4 million to < 10 million	0.78 (0.37–1.67)	0.94 (0.42–2.12)	0.52 (0.31–0.89)*	0.66 (0.37–1.15)
Missing data	0.56 (0.24–1.29)	0.72 (0.28–1.82)	0.43 (0.24–0.76)**	0.57 (0.30–1.11)
Household finances				
Unchanged	Ref.	Ref.	Ref.	Ref.
Improved	1.93 (0.65–5.69)	1.34 (0.43–4.17)	0.85 (0.29–2.43)	0.50 (0.17–1.49)
Worsened	1.94 (1.25–3.01)**	1.69 (1.05–2.70)*	1.18 (0.84–1.66)	1.12 (0.78–1.63)
Missing data	1.34 (0.40–4.51)	1.35 (0.36–5.03)	1.17 (0.48–2.84)	1.48 (0.56–3.88)
Self-rated health				
Good/very good	Ref. [‡]	Ref.	Ref. [‡]	Ref.
Fair	0.64 (0.40–1.02)	0.58 (0.36–0.96)*	0.53 (0.37–0.75)***	0.47 (0.32–0.69)***
Poor/very poor	0.86 (0.44–1.70)	0.71 (0.33–1.49)	0.43 (0.23–0.83)*	0.41 (0.20–0.82)*
Depressive symptoms	1.92 (1.19–3.10)**	1.99 (1.02–3.89)*	0.94 (0.60–1.47)	0.87 (0.47–1.60)
Anxiety symptoms	1.60 (0.89–2.86)	0.87 (0.40–1.92)	0.97 (0.57–1.65)	0.87 (0.43–1.79)
Perceived stress	1.01 (0.98–1.04)	1.00 (0.96–1.03)	1.01 (0.99–1.03)	1.01 (0.99–1.04)

[‡]Analyses were undertaken with 1285 respondents unless otherwise stated

[†]Analysis was undertaken with 1273 respondents

[‡] Analyses were undertaken with 1357 respondents unless otherwise stated

[‡] Analyses undertaken with 1345 respondents

OR: Odds ratio; CI: Confidence interval; Ref: Reference category

*** p < .001, ** p < .01, * p < .05

Multivariable analyses were adjusted for region

Table 4
Association between binge drinking and COVID-19 preventive behaviors in Japan (N = 1439).

COVID-19 preventive behaviors	PR (%)	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)
Wash hands after going out/before meal	70.8	0.50 (0.39–0.63)***	0.58 (0.44–0.75)***	0.59 (0.45–0.77)***	0.58 (0.44–0.76)***
Wear a mask	93.1	0.43 (0.28–0.65)***	0.48 (0.30–0.76)**	0.47 (0.29–0.75)**	0.47 (0.30–0.76)**
Gargle	53.0	0.86 (0.68–1.08)	0.93 (0.72–1.18)	0.94 (0.74–1.21)	0.93 (0.73–1.19)
Use tissue/sleeve when cough/sneeze	44.7	0.79 (0.63–0.99)*	0.86 (0.67–1.11)	0.87 (0.68–1.12)	0.85 (0.66–1.10)
Avoid touching face after touching objects	44.5	0.63 (0.50–0.80)***	0.76 (0.59–0.98)*	0.76 (0.59–0.99)*	0.76 (0.58–0.98)*
Disinfect hands/things that are touched often	55.6	0.75 (0.59–0.94)*	0.85 (0.66–1.09)	0.86 (0.67–1.10)	0.86 (0.67–1.10)
Cancel going out/traveling	55.5	0.89 (0.70–1.11)	0.96 (0.74–1.23)	0.98 (0.76–1.26)	0.97 (0.76–1.25)
Cancel planned events	8.2	1.38 (0.93–2.06)	1.33 (0.87–2.05)	1.36 (0.88–2.09)	1.34 (0.87–2.07)
Avoid crowds/try and stay home as much as possible	64.1	0.67 (0.53–0.85)***	0.71 (0.55–0.92)*	0.72 (0.55–0.93)*	0.72 (0.55–0.93)*
Avoid engaging in gatherings/parties even if few people	51.0	0.83 (0.66–1.05)	0.89 (0.70–1.15)	0.88 (0.69–1.14)	0.87 (0.68–1.12)
Avoid contact with the sick/elderly	30.4	0.85 (0.66–1.09)	0.95 (0.72–1.24)	0.95 (0.73–1.25)	0.95 (0.72–1.25)
If cold symptoms avoid contacts except family members	26.9	0.88 (0.68–1.14)	1.01 (0.76–1.35)	1.03 (0.77–1.37)	1.02 (0.77–1.36)
Keep a distance of 2 m from people when outside	30.6	0.76 (0.59–0.98)*	0.80 (0.61–1.05)	0.81 (0.62–1.07)	0.81 (0.61–1.06)

PR (%): Prevalence (%) of those engaging in the preventive behavior; OR: Odds ratio; CI: Confidence interval

Model 1 examined the bivariate association between binge drinking and COVID-19 preventive behaviors; Model 2 was adjusted for sex, age, education, marital status, job status, household income, family economic situation in the past year and SRH; Model 3 adjusted for the variables in Model 2 and depressive and anxiety symptoms.

Model 4 adjusted for the variables in Model 3 and the total stress score. All models were adjusted for region.

*** p < .001, ** p < .01, * p < .05

Statistically significant results are shown in bold font

including alcohol, are sometimes used as a form of self-medication to cope with psychological and emotional suffering/pain (Khantzian, 1997) and BD has been linked to depression in this context (Soloski, 2020). Indeed, BD might also be being used to cope in relation to the consequences of worsening household finances, as a recent study found that a deterioration in the household economy was linked to both mild-to-moderate and severe psychological distress in the early phase of the pandemic in Japan (Yamamoto et al., 2020).

Individuals aged 18–29 were more likely to report both increased and decreased BD during the COVID-19 pandemic. It is possible that different mechanisms may be involved in these contrasting outcomes. For example, there is some evidence that the psychological impact of the COVID-19 pandemic may have been greater on young and middle-aged Japanese adults compared to their older counterparts (Ueda et al., 2020; Yamamoto et al., 2020), possibly arising, in part, from disruptions and complications to education, work and social life (Ueda et al., 2020; Yamamoto et al., 2020). Increased alcohol consumption may have been one response to this, with a study showing that for some Japanese individuals an increase in alcohol use that occurred in the early ‘stay-at home’ phase of the pandemic, persisted across 2020 – especially among those that were relatively young (Nishijima et al., 2021). Conversely, because after work drinking with co-workers is common in Japan (Higuchi et al., 2007), the introduction of homeworking/teleworking in conjunction with reductions in the opening hours of bars/restaurants may have resulted in lower rates of BD – especially if it impacted on the *nomihodai* system – that allows fixed price drinking of different beverages over several hours, which has been linked to BD in Japanese college students (Kawaida et al., 2018a).

BD was associated with significantly lower odds for engaging in several COVID-19 preventive behaviors including hand washing, wearing a mask and avoiding crowds. This finding is consistent with the results from several studies. Increased alcohol consumption has been linked to lower adherence to COVID-19 social distancing protocols and hygienic behavior in a sample of the Norwegian general adult population (Ebrahimi et al., 2021), while alcohol abuse has been related to a disregard for COVID-19-related social distancing in American and Canadian adults (Taylor et al., 2021). Other studies among young adults (aged 22–28 and 18–25) reported an association between HED and poorer adherence to physical distancing guidelines (Einberger et al., 2021) and that BD was associated with increased social contacts during a ‘stay-at-home’ period (Suffoletto et al., 2020). It is possible that engaging in drinking events may itself be one reason for the lower engagement in COVID-19 preventive behaviors such as physical distancing (Einberger et al., 2021) although other mechanisms may be involved. For example, BD has been previously linked to personality traits such as (low) conscientiousness (Adan et al., 2017), which might also be important for adherence to COVID-19 preventive behaviors (Willroth et al., 2021).

Relatedly, research among problem drinkers has also indicated that they may have an optimistic bias, i.e. they believe they are less likely to experience (have a lower risk perception of) alcohol-related harm (Gire and Shaahu, 2021). As an earlier study has shown that optimistic bias can relate to a range of negative health outcomes including the likelihood of catching an infectious disease (Weinstein, 1982), then this might also be important for preventive behavior among binge drinkers during the COVID-19 pandemic, especially as the perceived threat/risk of disease is one of the main factors in preventive health behavior according to the Health Belief Model (Champion and Skinner, 2008). Recent research provides support for a possible association. Specifically, individuals have been found to have an optimistic bias regarding their own risk of infection during the COVID-19 pandemic (Salgado and Berntsen, 2021), while optimistic bias (Park et al., 2021), risk perception (Heydari et al., 2021), and (lower) concerns about infection (Enticott et al., 2021) have all been associated with differences in adherence to COVID-19-related preventive behaviors.

This study has several limitations. First, information was obtained

from an online sample. Although this data collection methodology has obvious benefits during an ongoing pandemic it might also have resulted in problems relating to the sample’s representativeness (Evans and Mathur, 2005). Second, information on current and pre-pandemic BD was self-reported. This may have resulted in reporting bias (Kawaida et al., 2018b). Third, we did not collect any information on motivations or expectancies associated with BD, BD scenarios (where, with whom etc.) or on the reasons for changes in the prevalence of BD. Such information would have helped us better understand BD and the factors associated with it during the COVID-19 pandemic. Fourth, data were analyzed from individuals aged 18 and above. Given that the minimum legal drinking age is 20 in Japan this may have affected our results although it has been reported that underage drinking is common and a significant social problem in the country (Higuchi et al., 2007). Finally, we used an adapted question from the U.S. National Institute on Alcohol Abuse and Alcoholism to assess BD. As what constitutes a standard drink differs between the U.S. and Japan (Kawaida et al., 2021) it is uncertain how appropriate this measure was to accurately assess BD in Japan.

In conclusion, this study has shown that BD is prevalent in Japan, that fewer people engaged in BD during the COVID-19 pandemic and that BD is associated with reduced odds for engaging in several COVID-19 preventive behaviors. Given that alcohol use has also been linked to other negative coronavirus-related outcomes (Kianersi et al., 2021; Lassen et al., 2021; Saurabh et al., 2021), the results of this study highlight the importance of public health messaging about the potential consequences of heavy alcohol use during the current pandemic (Norddeck et al., 2022). In addition, they also indicate that implementing measures to detect harmful drinking such as alcohol screening in healthcare settings (Sugarman and Greenfield, 2021) may also be potentially efficacious.

Funding sources

This work was partially supported by Health and Labour Sciences Research Grants for Comprehensive Research on Persons with Disabilities, AMED (20dk0307099), Intramural Research Grants for Neurological and Psychiatric Disorders of NCNP (3–1), and Japan Health Research Promotion Bureau Grants (2020-B-08, 2021-B-01) to TS.

Role of the funding source

Nothing declared.

Declarations of interest

None.

Contributors

AS had the study idea, analyzed the data and wrote the main text; ASH, was involved in the data collection and commented on and revised the manuscript; TI commented on and revised the manuscript; TS was in charge of the research project, oversaw the data collection and commented on and revised the manuscript.

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