Parental drinking and adolescent binge drinking: Findings from a nationwide high school survey in Japan

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Abstract

**Background:**
Alcohol problems in parents have been revealed as one factor affecting adolescent alcohol misuse, but there are few studies on how parental drinking affects adolescent alcohol misuse in the general population. The findings of previous studies are inconsistent with respect to the influence of parental drinking according to parental structure. Binge drinking among adolescents has received much attention. In this study, we aimed to examine the relationship between parental drinking in parents and binge drinking among high school students in Japan.

**Methods:**
We performed a secondary analysis of the Nationwide High School Survey on Drug Use and Lifestyle 2018, Japan.
A total of 46,848 valid surveys from high school students of 78 schools were included for analysis. Logistic regression analysis was conducted with binge drinking as the dependent variable. We established nine groups, classified according to parental drinking by parental structure (e.g., both parents, single parent, neither parent at home) as the independent variable, after adjusting with demographic factors and lifestyle factors as covariates. Binge drinking was defined as five or more alcoholic drinks for male adolescents or four or more alcoholic drinks for females on the same occasion within 2 hours.

**Results:**
In the fully adjusted models, the risk of binge drinking in adolescents whose parents do not drink (adjusted odds ratio (AOR): 0.541, 95% confidence interval (CI): 0.411–0.711) and whose father drinks but mother does not (AOR: 0.696, 95% CI: 0.575–0.844) were significantly lower than that in adolescents whose parents drink. This risk was significantly higher among students with neither parent living at home (AOR: 3.746, 95% CI: 2.290–
Conclusion:

Our findings suggest that adolescents whose parents do not drink and whose father drinks but mother does not are less likely to engage in binge drinking. Adolescents who did not live with either parent may have greater risk of binge drinking. This research revealed that parental drinking affects binge drinking among adolescents in the general population. Engaging parents, including mothers and non-parental family members, in future programs and interventions is important, to prevent adolescent alcohol misuse.

Background

Alcohol misuse is common among adolescents. In a recent survey, the rate of binge drinking was about 2.4% of high school students in Japan (1). This result is lower than the data from other countries, such as 13.5% of all high school students in the 2017 Youth Risk Behavior Surveillance in the United States (2), 14.4% with 12th graders in the 2019 Monitoring the Future Survey in the United States (3), and 35.0% of adolescents age 16 years in the 2015 European School Survey Project on Alcohol and Other Drugs (4). However, just because the rate of binge drinking in Japan is low, we should not make light of the problems because youth binge drinking is known to increase the risk of alcohol-related disorders, such as alcohol intoxication, as well as increasing the risk of accidents, fatal injuries, and chronic illness (5). Thus, binge drinking in adolescents can be considered more hazardous than adult drinking.

Emerging health research suggests that alcohol use is determined by multidimensional factors, including biological, genetic, psychological, and sociocultural characteristics (6, 7). Genetic variants affect the risk of alcohol misuse. Candidate genes related to alcohol dependence can be categorized into three groups, those related to alcohol metabolism, the stress response system, and behavioral disinhibition (8, 9). With respect to alcohol
metabolism, alcohol dehydrogenase and aldehyde dehydrogenase are known to have a protective influence against excessive drinking and alcohol dependence (10). Regarding the stress response system, the initiation and retention of binge-drinking behavior and alcohol dependence are related through dysregulated activation of the brain stress system by corticotropin-releasing hormone (11, 12). Behavioral disinhibition, defined as the inability to inhibit socially restricted actions including alcohol and other substance abuse, is related to the serotonin and dopamine pathways (13, 14). Previous studies have suggested that polymorphisms on tryptophan hydroxylase, serotonin transporter, and serotonin receptor genes in the serotonergic system and polymorphisms on dopamine receptors, dopamine β-hydroxylase, and tyrosine hydroxylase have been associated with risks for binge drinking and alcohol dependence (9, 15-17).

Psychological traits related to cognitive and emotional susceptibility to substance abuse are also crucial factors for the initiation and development of adolescent substance abuse (18). Among various psychological traits, impulsivity and sensation seeking have received the most attention owing to their influence on risky behaviors, including drinking alcohol (19, 20). High levels of sensation seeking and impulsivity are related to risk-taking behavior (21). Adolescents may be more sensitive to alcohol's reward and stimulant effects (22) and less sensitive to its sedative effects (23). Several studies imply that neural changes occurring during adolescence may temporarily increase sensitivity to certain effects of alcohol (e.g., reward effects) that promote consumption within a drinking episode while reducing sensitivity to other effects (e.g., sedative effects) that may help to limit drinking during an episode (24).

When it comes to environmental factors, etiological mechanisms representing multiple systems (e.g., family, peers, and community) interact across development to influence binge drinking trajectories (25). Notably, the influence of parents on drinking in their
children is important. Parental alcoholism and disrupted family relationships (e.g., parental separation or divorce) are both associated with binge drinking (26). Low parental monitoring, low levels of parental warmth, parental alcohol use, and parental expectations regarding their child’s alcohol use are associated with higher incidence of adolescent binge drinking (27). Binge drinking occurs in locations where there is no parental supervision, such as someone’s else’s home (28). During the high school period, the social context shifts from family to peers as important sources of influence on youth attitudes and behavior (29). Risk-taking behaviors may be facilitated by the presence of peers (30), and adolescent binge drinking tends to occur in social contexts that include peers (31). Community factors include the neighborhood and school environment. A recent study found that a supportive school environment (e.g., alcohol prevention incorporated into the curriculum) was associated with reduced adolescent binge drinking independent of individual, family, and peer risk factors (32).

The influence of alcohol on others has attracted attention in recent studies, including the potential impact of parental drinking on children. A meta-analysis of longitudinal studies highlighted parental drinking as a risk factor, together with parental provision of alcohol and parental attitudes toward drinking (33). The more the parents of adolescents drink, the more those adolescents tend to start drinking at younger ages (34, 35) and to drink larger amounts throughout adolescence (36). Parental alcohol use is predictive of both an earlier age of initiation and a greater increase in alcohol use across adolescent (37). The more often that fathers or mothers drink, the higher the scores on the Children’s of Alcoholics Screening Test (38). Several protective factors against adolescent alcohol misuse have been revealed. Four protective factors (e.g., parental monitoring, parent-child relationship quality, parental support, and parental involvement) have been identified as longitudinal predictors of both alcohol initiation and levels of later alcohol
use/misuse (33). In domestic research, parental attitudes (e.g., parents who do not involve their child in the adults’ drinking, warning their child about the dangers of alcohol use, communication about alcohol use, and awareness of the actual behaviors of their child) are important risk factors (39).

A number of studies have examined the effects of prenatal drinking exposure on child alcohol misuse. However, most studies focused on alcoholics and parents who have problems with alcohol (40-42), and less research is focused on how parental drinking, including normative drinking, influences alcohol misuse among children in the general population. A systematic review found that non-dependent parental drinking was associated with harm to children, including increasing the risk of alcohol initiation or drinking escalation (43), increasing the risk of adolescent alcohol misuse (33), and alcohol-related hospitalization later in life (44).

Another challenge for research in this area has to do with inconsistent findings regarding whether parents have the greatest impact on their child, owing to small sample sizes (45). In particular, how parental drinking affects child binge drinking, according to sex, is not well known. To the authors’ knowledge, research in Japan using nationally representative data examining parental and adolescent drinking does not exist. Amongst prior studies examining the role of drinking in both the father and mother, some show that only maternal drinking is significantly associated with adolescent drinking, after controlling for paternal drinking. In contrast, a 10-year cohort study conducted in Japan revealed that exposure to frequent drinking by the father during junior high school increases the risk of problematic drinking in later life (46). Other reports have found that drinking by both parents most affects adolescent alcohol misuse (36, 47).

The impact on adolescent drinking of parental drinking according to parental structure is also ambiguous. Most studies have not investigated parental drinking, according to sex
Several studies show that adolescents in one-parent households are more likely to drink than those in two-parent households (34, 47). However, we could not find any studies examining how not living with either parent influences adolescent alcohol misuse. In the real world, many adolescents do not live with either parent owing to divorce or the death of a parent (49).

Therefore, in this study, we aimed to investigate the relationship between current parental drinking according to parental structure (e.g., both parents, single parent, neither parent at home) and binge drinking among high school students in Japan.

Methods

Survey design and procedure

This study used secondary data from the Nationwide High School Student Survey on Drug Use and Lifestyle 2018 conducted by the National Institute of Mental Health in Japan. The survey was a cross-sectional study conducted between October 2018 and March 2019. Participants were high school students randomly selected using a stratified single-stage cluster method, with six regions as the strata and schools as the cluster. Schools were selected using random sampling with probability proportionate to the number of high school students in each region.

Self-administered questionnaires were distributed to students in each classroom; these were selected by the person in charge of substance abuse prevention at each school. The teacher in each classroom collected the completed questionnaires and returned them to our research center. We finally surveyed 116,313 students at 140 high schools nationwide.

Measures

A self-developed questionnaire comprising 43 items was used in the original survey. The analysis included demographic variables, lifestyle variables, information on the binge
drinking experiences of students, and drinking status of students’ father and mother, as below.

**Dependent Variable: Adolescents’ Binge Drinking During The Previous Month**

Students were asked, “In the past month, how many days were you at a drinking function (e.g., a gathering that lasted 2 hours or more) where you had many drinks (five or more drinks for males, four or more drinks for females)?” The response options were: not even once (1), 1–2 days (2), 3–5 days (3), 6–9 days (4), 10–19 days (5), 20–29 days (6), and every day (7). These responses were recoded as “past month binge drinking”, with response options of no (0) or yes (1).

In this research, binge drinking was defined as five or more alcoholic drinks for male participations or four or more alcoholic drinks for female participants on the same occasion within 2 hours (50).

**Independent Variable: Parental Drinking According To Parental Structure**

Students were asked the status of their parents’ alcohol use. First, the following question was asked: “Does your father consume alcohol regularly?” with response options No (1), Sometimes (2), Every day (3), and Father is not at home (working away from home, deceased, separated, divorced, and so on) (4). Second, we asked the following question: “Does your mother consume alcohol regularly?” with response options No (1), Sometimes (2), Every day (3), and Mother is not at home (4). Then, the responses were recoded as “Current paternal drinking” with response options no (1), yes (2) or Father not at home (3) and “Current maternal drinking” with response options no (1), yes (2), or Mother not at home (3). We finally combined and re-encoded those two items as “Parental drinking according to parental structure” with response options FD/MD (1): Both father and mother
drink, FD/MN (2): Father drinks but mother does not drink, FN/MN (3): Neither father nor mother drink, NF/MD (4): No father at home and mother drinks, FN/MD (5): Father does not drink but mother drinks, NF/MN (6): No father at home and mother does not drink, FD/NM (7): Father drinks and no mother at home, NF/NM (8): Neither father nor mother at home, and FN/NM (9): Father does not drink and no mother at home.

Covariates

The final models included demographic variables that have been found to be associated with adolescent binge drinking in prior research. Covariates included sex, grade (51), lifestyle habits, such as getting up, and going to the bed at the same time every day (52), eating breakfast, school life including enjoying school, family factors, such as eating dinner with one’s family (53, 54), hours spent in the absence of adults, talking with one’s parents about problems (39, 53, 54), peer factors, such as having close friends to hang out with, and having friends with whom to consult, thoughts on underage drinking (55), and confidence in refusing a substance when offered (26).

Data analysis

All data were coded and analyzed using IBM SPSS version 24 (IBM Corp., Armonk, NY, USA). Descriptive statistics, such as frequency, and percentage were used, based on the type of variable.

Logistic regression analysis was conducted with binge drinking during the past month as the dependent variable and current parental drinking according to parental structure as the independent variable. Finally, the odds ratio of each factor was calculated using the model, including all selected dependent variables.

Results

Descriptive statistics
A total of 47,280 completed surveys from students in 78 schools were collected (response rate: 56%) and 46,848 valid surveys were included for analysis (Table 1). In total, 51.6% of respondents were male, with 37%, 34%, and 29% 1st-year, 2nd-year and 3rd-year students respectively. The prevalence of binge drinking within the past month was 2.3% overall, (2.7% for male and 1.9% for female students). The prevalence according to frequency of paternal drinking was 33.2% for occasional drinkers followed by 32.9% for daily drinkers; the frequency of maternal drinking was 43.4% for occasional drinkers and 40.6% for no drinking. In other words, fathers tended to drink more frequently than mothers. Regarding parental structure, 83.8% of respondents lives with both parents, followed by 13.4% lived only with their mother, 1.7% with their father, and 0.3% with neither parent. The rate of parental drinking according to parental structure showed that nearly half of respondents (43%) were in the FD/MD group, followed by 22% in the FD/MN group, and 13.3% in the FN/MN group.

Table 1 Distribution of respondents according to demographic variables

| Demographic factors                        | Male        |    | Female       |    | Total       |    |
|--------------------------------------------|-------------|----|--------------|----|-------------|----|
|                                            | n  | %  | n  | %  | n  | %  |
| Grade                                      |    |    |    |    |    |    |
| 1st-year                                   | 9,035 | 37.4 | 8,337 | 36.9 | 17,372 | 37.2 |
| 2nd-year                                   | 8,268 | 34.2 | 7,606 | 33.7 | 15,874 | 34.0 |
| 3rd-year                                   | 6,845 | 28.3 | 6,631 | 29.4 | 13,476 | 28.8 |
| Getting up at the same time every day      |    |    |    |    |    |    |
| Yes                                        | 20,929 | 86.7 | 19,681 | 87.3 | 40,610 | 87.0 |
| No                                         | 3,201 | 13.3 | 2,862 | 12.7 | 6,066 | 13.0 |
| Going to the bed at the same time everyday |    |    |    |    |    |    |
| Yes                                        | 14,241 | 59.1 | 12,619 | 56.0 | 26,860 | 57.6 |
| No                                         | 9,866 | 40.9 | 9,902 | 44.0 | 19,768 | 42.4 |
| Eating breakfast                           |    |    |    |    |    |    |
| Yes                                        | 22,011 | 91.2 | 21,278 | 94.3 | 43,289 | 92.7 |
| No                                         | 2,122 | 8.8  | 1,280 | 5.7  | 3,402 | 7.3  |
| Enjoying school                            |    |    |    |    |    |    |
| Yes                                        | 21,044 | 87.3 | 19,738 | 87.6 | 40,782 | 87.5 |
| No                                         | 3,057 | 12.7 | 2,789 | 12.4 | 5,846 | 12.5 |
| Eating dinner with one's family            |    |    |    |    |    |    |
| Yes                                        | 20,087 | 83.3 | 18,653 | 82.7 | 38,740 | 83.1 |
| No                                         | 4,013 | 16.7 | 3,892 | 17.3 | 7,906 | 16.9 |
| Hours spent in the absence of adults        |    |    |    |    |    |    |


|                                      | Less than 3 hours | 3 hours or more | 19,773 | 82.6 | 19,061 | 85.1 | 38,834 | 83.8 | 4,168 | 17.4 | 3,348 | 14.9 | 7,516 | 16.2 |
|--------------------------------------|-------------------|----------------|---------|------|---------|------|---------|------|--------|------|--------|------|--------|------|
| **Having close friends to hang out with** |                   |                |         |      |         |      |         |      |        |      |        |      |        |      |
| Yes                                  | 22,939            | 95.4           | 21,900  | 97.3 | 44,839  | 96.3 |         |      |        |      |        |      |        |      |
| No                                   | 1,096             | 4.6            | 603     | 2.7  | 1,699   | 3.7  |         |      |        |      |        |      |        |      |
| **Having friends with whom to consult** |                   |                |         |      |         |      |         |      |        |      |        |      |        |      |
| Yes                                  | 21,529            | 89.8           | 20,992  | 93.6 | 42,521  | 91.7 |         |      |        |      |        |      |        |      |
| No                                   | 2,434             | 10.2           | 1,435   | 6.4  | 3,869   | 8.3  |         |      |        |      |        |      |        |      |
| **Talking with one’s parent about problems** |                   |                |         |      |         |      |         |      |        |      |        |      |        |      |
| Yes                                  | 14,661            | 61.2           | 17,411  | 77.6 | 32,072  | 69.2 |         |      |        |      |        |      |        |      |
| No                                   | 9,176             | 38.3           | 4,931   | 22.0 | 14,107  | 30.4 |         |      |        |      |        |      |        |      |
| No parent                            | 102               | 0.4            | 98      | 0.4  | 200     | 0.4  |         |      |        |      |        |      |        |      |
| **Thoughts on underage drinking**    |                   |                |         |      |         |      |         |      |        |      |        |      |        |      |
| Not acceptable                       | 16,234            | 67.7           | 16,571  | 73.7 | 32,805  | 70.6 |         |      |        |      |        |      |        |      |
| Acceptable                           | 7,762             | 32.3           | 5,914   | 26.3 | 13,676  | 29.4 |         |      |        |      |        |      |        |      |
| **Confidence in refusing a substance when offered** |                   |                |         |      |         |      |         |      |        |      |        |      |        |      |
| Yes                                  | 22,042            | 94.0           | 21,273  | 95.6 | 43,315  | 94.8 |         |      |        |      |        |      |        |      |
| No                                   | 1,408             | 6.0            | 981     | 4.4  | 2,389   | 5.2  |         |      |        |      |        |      |        |      |
| **Paternal drinking**                |                   |                |         |      |         |      |         |      |        |      |        |      |        |      |
| Every day                            | 7,644             | 31.8           | 7,650   | 34.0 | 15,294  | 32.9 |         |      |        |      |        |      |        |      |
| Sometimes                            | 8,291             | 34.5           | 7,130   | 31.7 | 15,421  | 33.2 |         |      |        |      |        |      |        |      |
| No                                   | 5,058             | 21.1           | 4,242   | 18.9 | 9,200   | 20.0 |         |      |        |      |        |      |        |      |
| Father is not at home                | 3,020             | 12.6           | 3,456   | 15.4 | 6,476   | 13.9 |         |      |        |      |        |      |        |      |
| **Maternal drinking**                |                   |                |         |      |         |      |         |      |        |      |        |      |        |      |
| Every day                            | 3,120             | 13.0           | 3,333   | 14.8 | 6,453   | 13.9 |         |      |        |      |        |      |        |      |
| Sometimes                            | 10,336            | 43.0           | 9,842   | 43.7 | 20,178  | 43.4 |         |      |        |      |        |      |        |      |
| No                                   | 10,029            | 41.7           | 8,886   | 39.5 | 18,915  | 40.6 |         |      |        |      |        |      |        |      |
| Mother is not at home                | 541               | 2.3            | 453     | 2.0  | 995     | 2.1  |         |      |        |      |        |      |        |      |
| **Parental structures**              |                   |                |         |      |         |      |         |      |        |      |        |      |        |      |
| Father and Mother                    | 20,529            | 85.0           | 18,657  | 82.6 | 39,186  | 83.8 |         |      |        |      |        |      |        |      |
| Mother only                          | 2,900             | 12.0           | 3,347   | 14.8 | 6,247   | 13.4 |         |      |        |      |        |      |        |      |
| Father only                          | 439               | 1.8            | 351     | 1.6  | 790     | 1.7  |         |      |        |      |        |      |        |      |
| Neither                              | 102               | 0.4            | 98      | 0.4  | 200     | 0.4  |         |      |        |      |        |      |        |      |
| **Parental drinking according to parental structure** | | | | | | | | | | | | | | |
| FD/MD                                | 10,205            | 42.6           | 9,708   | 43.2 | 19,913  | 42.9 |         |      |        |      |        |      |        |      |
| FD/MN                                | 5,354             | 22.3           | 4,800   | 21.4 | 10,154  | 21.9 |         |      |        |      |        |      |        |      |
| FN/MN                                | 3,428             | 14.3           | 2,762   | 12.3 | 6,190   | 13.3 |         |      |        |      |        |      |        |      |
| NF/MD                                | 1,682             | 7.0            | 2,049   | 9.1  | 3,731   | 8.0  |         |      |        |      |        |      |        |      |
| FD/MN                                | 1,542             | 6.4            | 1,387   | 6.2  | 2,929   | 6.3  |         |      |        |      |        |      |        |      |
| NF/MN                                | 1,218             | 5.1            | 1,298   | 5.8  | 2,516   | 5.4  |         |      |        |      |        |      |        |      |
| FD/NM                                | 353               | 1.5            | 258     | 1.1  | 611     | 1.3  |         |      |        |      |        |      |        |      |
| NF/NM                                | 102               | 0.4            | 98      | 0.4  | 200     | 0.4  |         |      |        |      |        |      |        |      |
| FN/NM                                | 86                | 0.4            | 93      | 0.4  | 179     | 0.4  |         |      |        |      |        |      |        |      |
| **Past month binge drinking**         |                   |                |         |      |         |      |         |      |        |      |        |      |        |      |
| No                                   | 23,141            | 97.3           | 21,909  | 98.1 | 45,050  | 97.7 |         |      |        |      |        |      |        |      |
| Yes                                  | 641               | 2.7            | 430     | 1.9  | 1,071   | 2.3  |         |      |        |      |        |      |        |      |

1FN=Father drinks, MN=Mother does not drink, MD=Mother drinks, FN=Father does not drink, NM=No mother at home, NF=No father at home

Associations between parental drinking according to parental structure and binge drinking
Both the unadjusted and adjusted results of our logistic regression analysis suggested significant associations among three groups (Table 2). When risk of the FD/MD group was set as a reference, after adjusting for 13 variables as covariates, including sex, grade, getting up at the same time every day, going to the bed at the same time every day, eating breakfast, enjoying school, eating dinner with one’s family, hours spent in the absence of adults, having close friends to hang out with, having friends with whom to consult, talking with one’s parents about problems, thoughts on underage drinking, and confidence in refusing a substance when offered, the FD/MN group (adjusted odds ratio (AOR): 0.696, 95% confidence interval (CI): 0.575–0.844) and the FN/MN group (AOR: 0.541, 95% CI: 0.411–0.711) had significantly lower risk and the NF/NM group (AOR: 3.746, 95% CI: 2.290–6.127) had significantly higher risk than the FD/MD group. However, student who lived with a single parent did not show any significant differences.

**Table 2 Logistic regression examining associations between parental drinking according to parental structure and adolescent binge drinking**

| Parental drinking | Unadjusted odds ratio (95% CI$^2$) | p-value | Adjusted odds ratio$^2$(95% CI) | p-value |
|-------------------|-----------------------------------|---------|---------------------------------|---------|
| FD/MD             | 1.00(reference)                   |         | 1.00(reference)                 |         |
| FD/MN             | 0.622(0.521–0.743)               | <0.001**| 0.696(0.575–0.844)              | <0.001**|
| FN/MN             | 0.437(0.340–0.561)               | <0.001**| 0.541(0.411–0.711)              | <0.001**|
| NF/MD             | 1.339(1.099–1.630)               | 0.004*  | 1.053(0.840–1.320)              | 0.655   |
| FN/MD             | 1.028(0.807–1.308)               | 0.825   | 0.885(0.671–1.167)              | 0.387   |
| NF/MN             | 0.856(0.648–1.132)               | 0.275   | 0.865(0.634–1.182)              | 0.364   |
| FD/NM             | 1.751(1.179–2.602)               | 0.006*  | 1.214(0.768–1.918)              | 0.406   |
| NF/NM             | 6.895(4.654–10.214)              | <0.001**| 3.746(2.290–6.127)              | <0.001**|
| FN/NM             | 0.425(0.105–1.716)               | 0.229   | 1.199(1.044–1.376)              | 0.162   |

$^1$FN=Father drinks, MN=Mother does not drink, MD=Mother drinks, FN=Father does not drink, NM=No mother at home, NF=No father at home

About gender, grade, getting up at the same time every day, going to the bed at the same time everyday, eating breakfast, enjoying school, eating dinner with one’s family, hours spent in the absence of adults, having close friends to hang out with, having friends with whom one can consult, talking with one’s parent about one’s problem, thoughts on underage drinking, and confidence in refusing a substance when it is offered. * P < 0.1  ** P < 0.01

**Discussion**
This is the first study to examine the relationship between parental drinking according to parental structure and binge drinking in a randomly selected nationally representative sample of high school students in Japan. In both the unadjusted and adjusted models, which included 13 variables, we found a relationship between adolescent binge drinking and parental drinking, including both parents who do not drink, father drinks but mother does not, and neither parent is living at home.

**Effects Of Parental Drinking**

The present study findings suggest that if both parents do not have a habit of drinking, this will likely reduce the risk of their child engaging in binge drinking. This finding is consistent with those of several studies reporting that drinking in both parents is likely to increase the risk of adolescent alcohol use (36, 47). There are a few possible issues to consider regarding this finding, First, drinking by both parents is more likely to increase the availability of alcohol beverages and the likelihood of drinking. Most Japanese high school students who currently drink find alcohol beverages at home (56). Second, being in a family where both parents drink may be more favorable to drinking than being in a family where the parents do not drink. Favorable attitudes towards alcohol use has been identified as a longitudinal predictor of both alcohol initiation and levels of later alcohol misuse (33). Third, a study in Japan showed that drinking in front of children has a greater influence than daily alcohol consumption by parents. Moreover, the authors of that study added that nearly 80% of fathers and over 50% of mothers in the survey sample drank in front of their child (39). Social learning theory may be related to these findings. Adolescents engage in behavior modeled by their parents (57), conceptualizing the process by which paternal and maternal drinking encourages adolescent drinking development (36). Further, expectations about the positive outcomes of alcohol use are transmitted from parents to their offspring even before the initiation of alcohol use (58).
Finally, we would like to discuss the parenting aspects. Research findings imply that children of parents whose drinking places them in the middle consumption tier are most likely to experience a negative outcome (e.g., less attention, irregular bedtime, and less time to complete homework) owing to their parent’s drinking (52). Thus, environments where both parents drink may be associated with the availability of alcohol, favorable parental attitudes toward alcohol use, modeling of parental drinking, and negative influences on child behaviors.

**Effect Of Maternal Drinking**

Our findings suggest that in two-parent families, having a mother who does not drink may be related to the lower risk of binge drinking in the child. Previous findings have been inconclusive regarding whether the mother or father has a stronger effect on drinking in their child; however, the current findings support that maternal drinking is associated with higher risk for drinking behavior in the child as compared with paternal drinking. First, we must consider the features of alcohol use among women. Blood alcohol concentration tends to increase rapidly in women and women can develop alcohol-related problems more easily than men. Fetal alcohol syndrome can also arise owing to drinking during pregnancy (59). Thus, drinking in women may be more likely to become problematic and to influence their child in some way. Second, we should consider that mothers have drinking habits may exhibit attitudes of approval toward alcohol use in their child. In some studies, mothers’ disapproving attitudes about child alcohol use was found to be associated with alcohol use in the child (60). Recommendations about alcohol use from the mother to the child may also be a risk factor, to a certain degree (39). Third, our findings imply a lack of the mothers’ role in the family if she has a drinking problem. Mothers typically provide much of the care for the children, and maternal problematic drinking likely has a greater negative impact on children than paternal problematic drinking as it deteriorates the
support structure within the family (61). However, we did not examine the degree or frequency of drinking by parents, so we were unable to screen the parents of respondents to determine whether they were a normative or problematic drinker. However, drinking in mothers may have greater influence on adolescent binge drinking, considering alcohol problems specific to women and the women’s role in the home.

Effect Of Not Having Parents At Home

As the third finding, our students who did not live with either parent had higher risks for binge drinking, although those who lived with one parent did not show significant differences. Our finding of an association between students who do not live with either parent and binge drinking was new. Research shows that “custodial grandchildren typically receive care from grandparents because of predicaments among their parents such as substance abuse, child abuse and neglect, teenage pregnancy, death, illness, divorce, incarceration, and HIV/AIDS” (62). The circumstances in which children do not live with either parent may vary from country to country, but we can infer that children did not live with either parent was living in the difficult environment. What can be thought of as adolescents that do not live with either parent is more likely to be associated with the lack of a family system. Living in an fragmented family increases the risk of frequent drinking and drunkenness among adolescents (63). The protective parental factors mentioned earlier (e.g., parental monitoring, parent-child relationship quality, parental support, and parental involvement) do not function at all in such family situations, which results in negative effects on the children. Thus, we suggest that children who do not live with either parent may be a high-risk group for binge drinking and should be the target of intervention, more so than those who live with at least one parent.

There are several limitations in the present research. First, owing to its cross-sectional design, we were unable to examine the temporal relationship between parental drinking
and child binge drinking; studies conducted using a longitudinal design are recommended. Owing to analysis of secondary data, we were unable to consider a number of potentially important factors such as genetic predisposition, adverse childhood experiences, social influences, and parental mental health. In addition, data of parental drinking were collected from the children and depended on the students’ perceptions; therefore, the representativeness of the parental data may not be accurate. No survey questions regarding the amount and frequency of drinking by parents were included, so we are unable to distinguish whether parents had problem drinking. In future research, data should be collected from both the parents and children, including items querying the amount and frequency of drinking. Finally, we did not examine whether parental drinking influenced adolescents according to sex. Further longitudinal studies to assess the deferential effects of parental drinking on adolescents according to sex are needed, as past results have been inconsistent (48). Further research should investigate adolescent binge drinking according to sex differences, to clarify the relationship between drinking in parents and their children.

Conclusions

Using a nationally representative sample of Japanese high school students, the findings of the present research suggest that adolescents whose parents do not drink or whose father drinks but whose mother does not are less likely to engage in binge drinking. Adolescents whose parents do not live with them at home may be more at risk of binge drinking. Our findings add substantial evidence to that of previous studies regarding parental drinking and adolescent misuse of alcohol. Focusing on the engagement of parents including mothers and non-parental family members, is important to preventing adolescent alcohol drinking in future programs and interventions.
Declarations

**Ethics approval and consent to participate**

The current study was approved by the Committee on the Ethical Guidelines for Medical and Health Research Involving Human Subjects of the National Center of Neurology and Psychiatry (Approval No: A2018-055). Verbal informed consent was provided by participants who agreed to the survey.

**Consent for publication**

Not applicable.

**Availability of data and materials**

The datasets supporting the conclusion of this article are available from the corresponding author on reasonable request.

**Competing interests**

The authors declare that they have no competing interests.

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**Authors’ contribution**

TS and TM conceived the study and initiated its design. All authors developed the questionnaire. TS and SI coordinated and carried out the study and data collection as well as performed the statistical analyses. SI and TS drafted the manuscript. All authors revised and approved the final manuscript.

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