

## How Severe is Binge Drinking in Malaysia and Who are at Risk?

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### Abstract

**Study Background:** Binge drinking is one types of harmful alcohol use that lead to several adverse health effects either to the drinker or to others.

**Objective:** This study aims to identify the prevalence of binge drinking among the current drinker and its socio-demographic determinants. Subsequently provide information to assist relevant authorities in the planning and control of the harmful use of alcohol.

**Methods:** The data were obtained from a cross-sectional study using a validated self-administered questionnaire of the Alcohol Use Disorder Identification Test – Malay version (AUDIT-M). Binge drinking was defined as having 6 or more drinks in on one occasion. An analysis of complex survey data was conducted using STATA 11 followed by multiple logistic regressions to examine the effects of potential socio-demographic determinants and the presence of comorbid smoking and bingeing compared to data from current drinkers.

**Results:** Of the current drinkers in Malaysia (n=1759), half reported had engaged in binge drinking. Males and smokers were significantly prone to binge drinking. There was a higher proportion of Malays, Bumiputera Sabah and Sarawak with evidence of binge drinking behaviour compared to non-binge drinkers. Multiple logistic regression analysis demonstrated a higher likelihood of bingeing among males (aOR=1.4, 95% CI: 1.0 - 1.8), Bumiputera Sabah and Sarawak (aOR=1.7 (1.3 - 2.3), as well as those who are smoking (aOR=1.6, 95% CI: 1.3 - 2.2) when compared to non-binge drinkers.

**Conclusion:** One in two current drinkers in Malaysia who are 13 years and older reported had engaged in binge-drinking. Thus, increase attention should be given to the current drinkers drinking habits especially if they are males, Bumiputera Sabah and Sarawak, as well as to the current smokers.

**Keywords:** Alcohol; Binge drinking; Current smoker; Malaysia

### Introduction

The general understanding of binge drinking is drinking excessive alcoholic beverages with a primary intention becoming intoxicated. Binge drinking is considered to be a major public health issue due to the health and social consequences associated with excessive drinking. This study defined the term as had consumed six (6) or more drinks on one occasion [1]. This definition follows heavy episodic drinking criteria used in Alcohol Use Disorder Identification Test (AUDIT) questionnaire. AUDIT questionnaire was developed and validated by World Health Organization [2]. In Malaysia, prior to this study, a few definitions have been used to define binge drinking [3]. However, in 2010 alcohol screening and intervention (alcohol SBIRT) program was started in Malaysia and AUDIT was used as a screening tool. In relation to this, this study used AUDIT to screen for binge drinking pattern.

The prevalence of binge drinking is rising globally in part because bingeing has become quite common and widespread among adolescents and young adults [4-8]. Binge drinking, a type of drinking pattern observed predominately in males [9], causes acute intoxication that may lead to adverse health consequences, including unintentional injuries, violence, suicide, unintended pregnancy, hypertension and myocardial infarction [10,11]. Low risk drinking patterns has beneficial effect on selected disease outcomes however those effects tend to disappear by practicing heavy episodic drinking [12].

Thirty-eight million adults in the United States engage in binge drinking behaviour an average of 4 times per month. Binge drinkers

have a 14-fold increased risk of engaging in alcohol-impaired driving compared to non-binge drinkers [10]. Additionally, the rate at which underage drinking has increased is alarming, especially given the potential relationship between the early exposure to binge drinking and poor health outcomes later in life, e.g., psychiatric morbidity and alcohol dependence and abuse [13,14]. Studies worldwide have indicated that those from a low socioeconomic status, e.g., low education attainment and low household income, are more likely to binge drink [6,15]. Whether prevalence estimates of binge drinking are high or low are not as important as considering their constant binge drinking habit [10], and the amount or threshold of consumption at which people begin to experience adverse health consequences.

There are other risk factors that have been associated with the morbidity and mortality related to excessive alcohol use. Alcoholic beverages often differ with respect to the concentration of alcohol they

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contain, which may contribute to different health risks to the drinkers [16]. Alcohol-drinking intensity and intake frequency have also been associated with the risk for alcohol-attributable harm [8]. In addition, comorbid smoking and excessive drinking are known to be associated with different types of cardiovascular diseases [17,18]. Smoking is a contributory factor that may result in a higher intake of alcohol, and this concomitant risk factor may lead to alcohol or tobacco use disorder, which may worsen the health status of the drinker [18].

In Malaysia, according to the National Health and Morbidity Survey (NHMS) in 2006, the reported prevalence of binge drinking (drinking more than 4 units for male and more than 5 units for female at one time) among current drinkers was 30.6%. Across age domain, less than half of all current drinkers were binge drinkers, with prevalence in each age group ranging from 10 to 50 per cent. Of adolescent drinkers, 24.6 per cent engaged in binge drinking [3]. Data from hospitals in Malaysia recorded 48 per cent of mental health problems due to psychoactive substance was mainly caused by alcohol. While 0.5 percent of reported road traffic deaths were contributed by those who were driving under the influence of alcohol [19].

As the pattern of binge drinking is becoming popular [20,21], problem with binge drinking habit and heavy episodic drinking does not reflect the actual number of them in the general population [10]. Typically alcohol screening been done in primary health care to find persons with alcohol problem [19]. Hence, binge drinking problem is only detected among those who visited health care facility, thus intervention and treatment is given to them. At present moment in Malaysia, not all primary health care clinics provide alcohol screening for drinkers that unable to detect binge drinking for monitoring and intervention. Moreover, latent binge drinkers in population are usually with the absence of disorder are missed for alcohol screening, and they will continually practice this harmful drinking habit until they become severe for specialized treatment.

This study is important to address the binge drinking and its socio-demographic characteristics. The information on this subject is important to stakeholder and program manager for formulation of national policy and strategies to prevent and reduce binge drinking habit in a specific target group in population. For addiction specialist, this information will ensure more proactive and intensify screening that enable focus intervention to reduce binge drinking habit among alcohol drinkers who visit health care centre.

The aim of this study was to assess socio-demographic characteristics among binge drinkers based on residence, age group, sex, socioeconomic status and the presence of smoking behaviour. We also sought to examine the severity of binge behaviour based on risk levels (low risk, risky, or high-risk).

## Methodology

### Source of data

Data from a cross-sectional NHMS 2011; alcohol module were used to investigate estimates of binge drinking behaviour in the general population in Malaysia. The NHMS is carried out on a regular basis to provide community-based prevalence estimates of relevant health and morbidity data in Malaysia. In 2011, the NHMS was implemented from April 2011 to July 2011.

In brief, a two stage stratified random sampling design with a proportionate allocation across the stratum was used in this study. Details of the methodology were provided in the reports [22]. Eligible

households age 13 years old and above who consented to participate were selected in this study. The NHMS 2011 study protocol was approved by the Medical Review and Ethics Committee (MREC), Ministry of Health Malaysia.

A structured, self-administered and validated Alcohol Use Disorder Identification Test questionnaire for the Malay language version (AUDIT-M) was used in this study. Details of the AUDIT questionnaire have been discussed and published elsewhere [2,23,24]. The AUDIT-M questionnaire is available in four languages including the original English, Malay, Chinese, and Tamil version. The Malay language translation was back translated and cross-culturally validated (Pearson's correlation,  $r=0.94$ , Cronbach  $\alpha=0.84$ ), while the Chinese version was adapted from the validated Chinese study [25]. Respondents were provided with a reference codebook that illustrated a standard drink to calculate the total amount of drinks consumed on the typical day that they drink.

### Subjects

In total, 21,011 respondents participated in this NHMS study. For the purpose of this study, subjects included all of the current drinkers who had consumed alcoholic beverages for the past 12 months prior to data collection. Among all respondents, 86.7% ( $n=18,215$ ) were excluded from this study due to life-time abstention and 4.1% ( $n=856$ ) reported did not drink alcohol for the past 12 months. There were 12.4% ( $n=1759$ ) respondents who qualified in this study, and 0.7% ( $n=181$ ) refused to participate.

### Use and definition of variables

All study variables in categorical were selected from the following categories; Socio-demographic variables, use of alcohol and smoking status. Socio-demography variables include residency comprises urban and rural, sex, age categorised into four which is 13 to 17, 18 to 29, 30 to 39, 40 to 49, 50 to 59 and 60 years old and above. Ethnicity in Malaysia includes Malay, Chinese, Indian, Bumiputera Sabah and Sarawak (Borneo native) and 16 other ethnicities were grouped in "Others". For socioeconomic status indicator like education attainment and household income were used. Education attainment includes no formal education, primary education, secondary education and tertiary education. Household income was categorised into four income group includes less than RM 1000, RM 1000 to RM 2999, RM 3000 – RM 4999 and more and equal to RM 5000 and above.

For alcohol use variable, current drinker was defined for respondent who had consumed alcohol for the past 12 months. This definition is used in accordance with NHMS 2011. Binge drinking was defined respondent who had consumed more than six drinks of any alcoholic beverage on one occasion applied for both males and females. Possible answer to this question includes the following: (0)=Never, (1)=Less than once a month, (2)=Monthly, (3)=Weekly, or (4)=Daily or almost daily. Those who answered category (1), (2), (3) or (4) were grouped and classified as binge drinkers while those who answered (0)=Never were classified as non-binge drinkers. In Malaysia, one standard drink of alcoholic beverage contains 10 g of pure alcohol. The binge drinking is defined as having six or more drinks on one occasion, therefore its' contain 60 gram of pure alcohol [19,24,26].

Frequency of drinking was measured by how much drink respondent had for the past 12 months with a possible categorical answer (1)=once in a month (2)= 2 to 4 times a month (3)=2 to 3 times a week or (4)=4 or more times a week.

The types of alcoholic beverages were grouped and classified according to the percentage of alcohol content. Category 1=Shandy with alcohol content less than 2%, category 2=Beer includes Lager, Ale, or Stout, with alcohol content less than 9%. Category 3=Wine, includes cider, champagne, *peri, tuak, tuak kelapa, lihing* or *todi*, with alcohol content between 10 to 25%, and category 4=Brandy includes rum, whisky, vodka, *gin, samsu, samcheng, montoku* or *langkau* with alcohol content more than 30%.

The respondent's risk level was based on the AUDIT final score. Risk was categorised into three categories, which are as follows: low risk drinker with a score between 1 to 7, risky drinker with a score between 8 to 19, and high risk drinker with a score of 20 and above.

For other personal risk factor like data for current smoking status were obtained from the smoking module of the NHMS 2011 study. Current smoking status defined for respondents who smoke for the past 12 months with categorical answer "yes" or "no".

### Data analysis

Both descriptive and inferential statistics were carried out using Stata11 Software (Stata Corp LP). Data were analysed using a complex sample design. Design effects were calculated to estimate the impact of a complex sample design on variance estimates.

Descriptive bivariate categorical analyses were calculated to estimate the proportion and characteristics of binge drinking by socio-demographic factors. Bivariate analysis was also conducted to assess the estimated proportion for binge drinking based on their risk level and their preference for alcoholic beverages.

Multiple logistic regression modelling was used to determine the effects and potential independent risk factors based on socio-demography characteristics i.e. residency, sex, age, ethnicity, education level, household income and concurrent smoking towards binge drinking habit. The preliminary assessment for the selected model was conducted using a fitted model that included the adjusted Wald Tests, which tested the contribution of individual model parameters. Diagnostic testing to assess Goodness of Fit was conducted to ensure the fit of a logistic regression model for individual cases or covariates. Interactions testing were assessed to ensure whether any interactions scientifically relevant among the predictors that may affect the model in term of multicollinearity. A final model was created that included all predictors that were significantly associated at p-values < 0.05.

## Results

### Respondent's socio-demographic profiles

A total of 20,954 respondents were eligible to answer the alcohol module from NHMS 2011. Based on the AUDIT questionnaire, 1,759 respondents were classified as current drinkers. The majority of respondents (65%) resided in urban areas and 75% of them were male. The population consisted of the following ethnicities: 4% Malay, 54% Chinese, 14% Indian, 21% Bumiputera Sabah and Sarawak, and 6% ethnicities other than those described. Approximately 45% of respondents had completed at least secondary school, followed by 27% who had at least a primary school level of education. The number of respondents was equally distributed by income levels.

The prevalence of binge drinking among the total population in Malaysia was 5.7% (95% CI: 5.1% - 6.4%), while the prevalence of binge drinking among current drinkers in Malaysia was 50.2% (95% CI: 46.9% - 53.5%). The socio-demography characteristics of binge drinker

are described in Table 1. Despite a higher prevalence of current drinker in urban compared with rural, but there is no statistically significant for binge drinking in either urban or rural. Male was more prevalent to current alcohol use and as expected there were a significantly larger proportion of males engaged in binge drinking behaviour than females.

Chinese was the higher to consume alcohol, however, they were among the least who binged compared with other ethnicities. Despite the lowest alcohol use among the Malays, they were among the highest that binged. Bumiputera Sabah and Sarawak were among the highest alcohol consumption and substantially more than half of them had engaged in binge drinking behaviour. The prevalence of binge drinking behaviour among other ethnicities was moderate, while Indians were among the lower alcohol consumed as well as were the lowest prevalence with binge drinking behaviour.

Current alcohol use and binge drinking showed similar pattern that increased by age and declined steadily by the age of 40 and above, however there was no significant difference in binge drinking across age group. High household income and high education attainment was statistically significant to current alcohol use but there was no significant difference for binge drinking by this socioeconomic status. Of the binge drinkers older than 13 years of age, 47.4% were also current smokers.

### Preference for Alcoholic Beverages

By types of beverages, more than half of binge drinkers preferred Beer [59.8% (95% CI: 55.2% - 64.2%)] than other alcohol beverages. Preference for Wine [15.7% (95% CI: 12.3% - 19.7%)] and Brandy [14.8% (95% CI: 11.5% - 18.9%)] were equivalent; however, Shandy [9.7% CI: 7.0% - 13.3%)] was the least preferred beverage.

### Alcohol Consumption Frequency

Figure 1 shows the prevalence of alcohol consumption frequency among the binge drinkers for the past 12 months. Most of the binge drinkers drink less frequent at least once a month. The pattern of drinking frequency declined steadily by the frequency of alcohol intake among the binge drinkers.

### Binge drinking based on risk level

Despite a high prevalence of current alcohol use among the low risk drinker, the prevalence of binge drinking was lower among the low risk group when compared to the risky and high-risk groups. Of the risky and high-risk groups, more than 90% of drinkers were binge drinkers (Table 2).

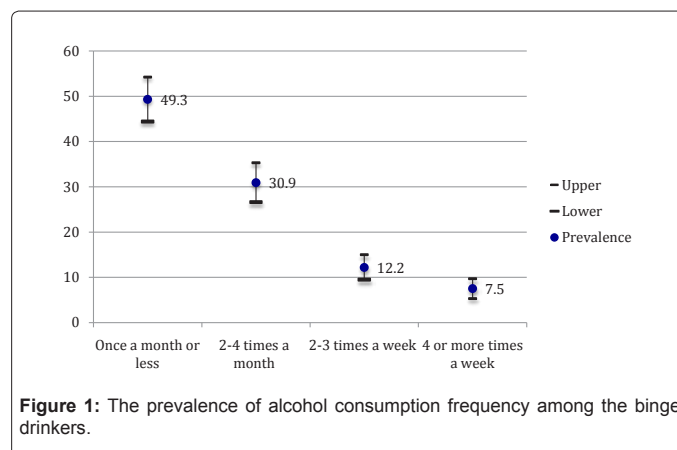


Figure 1: The prevalence of alcohol consumption frequency among the binge drinkers.

Predictor	Current drinker	Category				Current drinker who binged			
		n	N	Prevalence (95%CI)	p-value	n	N	Prevalence (95%CI)	p-value
Residence	Urban	1144	1,887,084	12.6 (11.3 - 14.0)	p < 0.001	535	914,136	49.4 (45.6 - 53.3)	p = 0.307
	Rural	615	507,119	8.9 (7.3 - 10.9)		297	269,005	53.0 (47.3 - 58.7)	
Sex <sup>a</sup>	Male	1314	1,815,499	17.2 (15.6 - 18.9)	p < 0.001	683	961,599	53.5 (49.8 - 57.2)	p < 0.001
	Female	445	578,705	5.7 (4.9 - 6.6)		149	221,541	39.6 (34.0 - 45.4)	
Age	13-17	83	121,053	4.2 (3.2 - 5.6)	p < 0.001	33	50,889	43.5 (30.9 - 56.9)	p = 0.150
	18-29	504	866,649	14.0 (12.2 - 16.0)		264	458,442	53.5 (47.8 - 59.2)	
	30-39	418	568,060	14.5 (12.8 - 16.5)		207	28,7419	51.6 (45.5 - 57.6)	
	40-49	354	435,155	13.2 (11.3 - 15.4)		170	216,315	50.3 (43.6 - 56.9)	
	50-59	250	244,664	10.5 (8.8 - 12.4)		102	107,701	45.0 (37.8 - 52.4)	
	≥ 60	150	158,621	7.7 (6.2 - 9.5)		56	62,373	39.8 (30.5 - 50)	
Ethnicity <sup>a</sup>	Malay	197	89,353	0.9 (0.6 - 1.2)	p < 0.001	47	56,201	62.9 (49.6 - 74.5)	p < 0.001
	Chinese	966	1,416,401	27.5 (25.2 - 30.0)		401	624,737	45.2 (41.1 - 49.4)	
	Indian	255	272,439	18.8 (15.7 - 22.3)		109	120,641	44.8 (36.0 - 54.0)	
	Bumiputera Sabah & Sarawak	360	466,265	20.3 (16.8 - 24.3)		218	292,592	62.8 (56.7 - 68.4)	
	Others	107	149,743	11.3 (7.7 - 16.1)		57	88,969	59.4 (43.4 - 73.7)	
Education Level	No formal education	107	130,797	7.7 (5.6 - 10.5)	p < 0.001	40	59,323	46.4 (34.3 - 58.9)	p = 0.294
	Primary education	388	460,830	9.4 (8.1 - 10.9)		183	240,822	53 (46.4 - 59.4)	
	Secondary education	855	1,160,078	12.0 (10.7 - 13.4)		435	595,517	52.1 (47.2 - 57.0)	
	Tertiary education	401	635,858	15.0 (12.8 - 17.4)		174	287,478	46 (40.1 - 52)	
Household Income <sup>b</sup>	Less than RM 1000	240	280,575	7.8 (6.3 - 9.7)	p < 0.001	114	127,028	45.2 (37.5 - 53.2)	p = 0.216
	RM 1000 – RM 2999	544	679,781	9.3 (8.1 - 10.7)		269	364,761	54.2 (48.0 - 60.4)	
	RM 3000 – RM 4999	416	602,497	12.1 (10.3 - 14.2)		203	307,785	51.9 (45.2 - 58.6)	
	≥ RM 5000	559	831,350	17.3 (14.9 - 20.0)		246	383,566	47.3 (42.2 - 52.5)	
Smoking <sup>a</sup>	Smoking*Binge	692	921,613	19.9 (17.8 - 22.2)	p < 0.001	411	556,369	47.3 (42.3 - 52.4)	p < 0.001

Notes: <sup>a</sup>Significant differences were set at p < 0.05.

<sup>b</sup>At present moment USD 1 is approximately equal to RM 3.0925.

**Table 1:** Baseline socio-demographic variables among the current drinker and binge drinking in Malaysia.

Predictor	Category	Current Drinker				Current drinker who binged			
		n	N	Prevalence (95%CI)	p-value	n	N	Prevalence (95% CI)	p-value
Risk level <sup>a</sup>	Low-risk	1297	1,750,306	76.4 (73.6-79.0)	p < 0.001	449			p < 0.001
	Risky	359	499,843	21.8 (19.3 - 24.6)		339	647,970	95.7 (92.9 - 97.5)	
	High-risk	36	41,044	1.8 (1.2 - 2.7)		34	38,577	94.0 (72.6 - 98.9)	

Notes: <sup>a</sup>Significant differences were set at p < 0.05.

**Table 2:** Prevalence of current drinking and binge drinking according to risk level

### Predictors of Binge Drinking

Multiple logistic analyses were conducted for current drinkers above the age of 13. In the first model, binge drinking status was regressed on all predictors, i.e., residence, sex, ethnicity, education level, income, age and current smoking status. From the final model, the only predictors that had a significant relationship with binge drinking status were sex, ethnicity and current smoking status after adjusting for the relationship of other predictors at a p-value < 0.05.

The odds for binge drinking among the male was 1.4 times higher than that for females after adjusting for ethnicity and smoking. Bumiputera Sabah and Sarawak ethnicity was significantly associated with binge drinking and the odd of binge drinking behaviour in this

group was 1.7 higher than that for Chinese drinkers. Current smoking status was also significantly associated with binge drinking, and the odds of binge drinking behaviour were 1.6 times higher than that for non-smokers after adjusting for all other covariates (Table 3).

### Discussion

The prevalence of binge drinking behaviour in the overall general population in Malaysia is low (5.7%) when compared to the global prevalence [27]. Among the current drinkers, half of them engaged in binge drinking behaviour. The trends for binge drinking showed an increasing pattern and almost doubled by 2011 when compared to 2006 [3]. However, direct comparison could not be made as both studies

Variable	Simple Logistic Regression		Multiple Logistic Regression	
	Crude OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
<b>Residence</b>				
Urban <sup>c</sup>	1			
Rural	0.7 (0.5 - 1.0)	0.048		
<b>Gender</b>				
Male	1.4 (1.0 - 1.8)	0.028 <sup>a</sup>	1.4 (1.0 - 1.8)	0.033 <sup>a</sup>
Female <sup>c</sup>	1		1	
<b>Age</b>				
13-17 <sup>c</sup>	1			
18-29	1.2 (0.7 - 2.1)	0.579		
30-39	1.2 (0.6 - 2.1)	0.616		
40-49	1.1 (0.6 - 2.0)	0.727		
50-59	1.0 (0.5 - 1.8)	0.943		
≥60	0.9 (0.4 - 1.8)	0.716		
<b>Ethnicity</b>				
Malay	1.6 (0.8 - 2.9)	0.165	1.5 (0.8 - 2.6)	0.211
Chinese <sup>c</sup>	1		1	
Indian	0.9 (0.6 - 1.4)	0.561	0.9 (0.6 - 1.3)	0.512
Bumiputera Sabah & Sarawak	2.3 (1.6 - 3.3)	0.000 <sup>a</sup>	1.7 (1.3 - 2.3)	0.001 <sup>a</sup>
Others	1.7 (0.9 - 3.4)	0.100	1.4 (0.8 - 2.8)	0.267
<b>Education</b>				
No formal education <sup>c</sup>	1.0 (0.6 - 1.8)	0.579		
Primary education	1.3 (0.9 - 1.9)	0.113		
Secondary education	1.3 (0.9 - 1.7)	0.112		
Tertiary education	1			
<b>Household Income</b>				
< RM 1000 <sup>c</sup>	1			
RM 1000 - RM 2999	1.5 (1.0 - 2.3)	0.064		
RM 3000 - RM 4999	1.5 (0.9 - 2.5)	0.107		
≥ RM 5000	1.6 (1.0 - 2.5)	0.057		
<b>Smoking status</b>				
Non-smoking <sup>c</sup>	1		1	
Current smoking	1.6 (1.2 - 2.1)	0.003 <sup>a</sup>	1.6 (1.3 - 2.2)	0.000 <sup>a</sup>

n= 1,759. Adjusted Wald Test for all parameters:F(19,430)=3.86. p< 0.001

<sup>a</sup>Significant differences were set at p < 0.05.

<sup>c</sup>Reference categories for all categorical predictors are Resident (Urban); Gender (Female); Age (13-17); Ethnicity (Chinese); Education (Not Formal Education); Household Income (< RM 1000); Smoking Status (Non-smoking)

**Table 3:** Estimates of crude and adjusted odds ratios for binge drinking. (n= 1,759, N=2,394,204)

using different definition to measure binge drinking. This definition also maybe different to that noted in other countries, especially countries with a higher prevalence of alcohol use [7,10].

In this study, binge drinking was highest among the Bumiputera Sabah and Sarawak. The characteristics of binge drinking across race may differ due to differences in culture or attitude that may contribute to their binge drinking behaviour [16,28]. The high prevalence of such behaviour among Bumiputera Sabah and Sarawak may be related to culture where alcoholic beverages such as *Tuak* (home-brewed beverages) are considered traditional beverages. The tendency to binge also occurred during local festivals, such as Harvest festivals, where these alcoholic beverages are served and consumed in excess as a part of the celebration. As for Chinese, they may consume more alcohol due to social occasion but they were a low risk drinker that exhibits low prevalent for binge drinking habit. Surprisingly for the Indians, they were among the group that have been previously reported with high

consumption of alcohol and bingeing habit [29], but their drinking pattern trend are slowly improving due to attempt cessation on alcohol drinking [30].

Other factors that may contribute to increased alcohol drinking frequency and bingeing may be related to the way in which various groups drink. For example, the Malays drink less frequently due to religious restrictions, and we speculate that they rarely drink but once they drink, they may drink excessively and engage in binge-like behaviour. Other studies have correlated binge drinking with depression and anxiety, and it may be that some patients drink and engage in binge behaviours as a way to cope with unpleasant emotions [31]. This pattern of drinking frequency has been noted in our Malaysian drinkers who tend to drink less but drink to intoxication as a mechanism by which to cope with their depression [32].

As expected, our finding of a higher prevalence of binge drinking

among males has also been found in other studies [4,6,7,15,33-35]. In the United States, binge drinking behaviour is more serious among males than females where binge drinking among males is approximately three times higher than that in females [10]. This pattern is noted in relation to the higher frequency of alcohol use among males when compared to females [1,3,33]. Clearly, high consumption among males is simultaneous with bingeing habit compared with females. As in the present study, the proportion of drinking among males was higher than that in females, with males reporting alcohol use at least 2 to 4 times a month to a maximum of 4 or more times per week compared to females who primarily drank at least once a month and the majority of them were abstainers [32].

Binge drinking behaviour may correlate with the intensity of alcohol consumption on a typical day [8,36]. In the current study, the proportion of alcohol intensity among binge drinkers was high, ranging from at least 3 or 4 drinks on a typical day to 10 or more drinks daily. Males had relatively higher alcohol drinking intensity when compared to females [32]. This finding is similar to a study conducted in the United States where they found that males who binged consumed a larger number of drinks per binge episode than females [36].

Young adults are highly represented among binge drinkers, and most studies have reported that young adults contribute the most to the high prevalence of binge drinking noted in studies [10,14,37-39]. However, in this study, although there was no significant difference across ages, the pattern of binge drinking was more common among those from aged 13 to 29 years old. A study from the European region on binge drinking among children and adolescents found that those who binged came from a low-income family, and their bingeing was significantly associated with family conflict [40]. One study reported that underage binge drinking was associated with a coping mechanism for depression [40]. However, other factors, e.g., peers, may also contribute to binge-drinking behaviours among adolescents [6,40].

In this study, despite significantly high prevalent of current alcohol use among high income and high education attainment, these socioeconomic status do not affect binge drinking habit. In contrast, other studies reported a significant correlation between socioeconomic status with bingeing behaviour [6,7,34]. They had concluded those with a lower level of education attainment [6,33] and who reported higher income [6-8,10] had a higher prevalence of binge drinking behaviour.

Drinking frequency is positively correlated with bingeing as reported in most studies [8,13,41]. The high frequency of drinking among people who binge is relatively high when compared to those who do not binge, as found in most studies elsewhere [10,13,41]. However, in Malaysia, most binge drinkers drink less frequently (i.e., at least once a month or less). This finding differs from that noted in a United Kingdom study where most people drank more frequently (at least 2 times per week) [13].

Information on the types of alcoholic beverages that binge drinkers prefer is important for assessing policies, taxation practice, and marketing strategies related to drinking behaviour [23]. The geographic differences between groups also play an important role in determining the preference for alcoholic beverages and may influence the drinker via cultural differences of prices of alcohol in a region [24,27]. In United States, beer is still the most preferred drink of binge drinkers, and drinks with higher alcohol content, e.g., liquor, are the second most preferred alcoholic beverage [23]. Our study also showed similar preferences for beer among binge drinkers and that such drinkers were least likely to prefer beverages of low alcohol content like Shandy. In

low-income countries such as Bangladesh, most binge drinkers prefer to drink beverages with high alcohol content than alcoholic beverages with low alcohol content [42].

Alcohol consumption and tobacco use have always been associated with an increased risk of cardiovascular disease [17]. The concurrent use of alcohol and tobacco has been investigated in various studies [17,41]. In the US, approximately 10 to 15 per cent of men and women reported consuming both alcohol and tobacco [43]. Of the drinkers, those who smoked had a higher likelihood of engaging in binge drinking behaviour when compared to non-smokers [41]. The findings are similar to our study where the risk of bingeing was higher among smokers than non-smokers. In Hong Kong, for instance, females who smoked were at greater risk of bingeing if they were concurrent smokers [41]. Perhaps, health campaign on Smoking should disseminate clear messages to the public on preventing concurrent excessive drinking because such behavioural may increase higher risk to their health outcomes. Cessation clinic should proactively consider screening for patients with alcohol use for early alcohol intervention when necessary.

Research shows that low risk drinkers are not likely to experience an alcohol use disorder [8]. To date, there have not been many studies exploring the relationship between drinking risk level and binge drinking behaviour. In the United States, binge drinking behaviour was not a common practice among high-risk or alcohol-dependent drinkers [8]. However, in contrast to these findings, our study revealed that binge drinking was higher among risky and high-risk drinkers. This pattern indicates that the harmful use of alcohol, which includes binge drinking behaviour, were more common among risk-taking and alcohol-dependent individuals in Malaysia.

## Limitations

The AUDIT-M used in this study has been validated in only two languages, Malay and Chinese. The Tamil version has not been validated, although the Tamil translation was developed to facilitate the ability of Indian respondents to answer our instrument in their own language.

Secondly, the definition of binge drinking may vary based on the country. Our study defines binge drinking as six or more drinks on one occasion and applied to both males and females in accordance to definition used in NHMS 2011 for the screening of alcohol use in general population. Several countries have used different definitions to define binge drinking, e.g., in the United States and Hong Kong, binge drinking was defined at 5 or more drinks on at least one occasion [10,11,41], which is lower than the Malaysian definition. A study in Russia distinguished binge drinking on the basis of gender [33].

At present moment, we also used a standard WHO/AUDIT cut-off scores to classify risk level for our Malaysian drinker [19], because there is no yet Malaysian-based cut-off standard to assess the actual risk for alcohol use and binge drinking using AUDIT-M. However, this value has been used in primary health care setting for the purpose of early screening among patients. The risk level might not have been accurate due to differences in drinking characteristics and alcohol metabolism. We anticipate that further psychometric evaluation studies on AUDIT-M to measure drinking risk accurately according to Malaysian population and also to establish definition for binge drinking by gender prior to the detection and creation of focused interventions and treatments for this population.

## Conclusion

Binge drinking behaviour among current drinkers is a significant problem in Malaysia. In particular, this pattern of drinking is quite problematic for males, Bumiputera Sabah and Sarawak as well as those who concurrently smoke. Focused interventions in the future should be targeted to this high-risk group to reduce the further harmful use of alcohol among drinkers and to reduce the burden of non-communicable diseases related to alcohol use.

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