

## Alcohol use in Macau Secondary School Students and relating family factors

Teng Fai Ng<sup>1</sup>, Lin Ian Lio<sup>2\*</sup>

1 Health Bureau, Centre for Disease Control and Prevention (CDC), Macau  
2 Centro Hospitalar Conde de São Januário (CHCSJ), Psychiatry Department, Macau

\* Corresponding Author Lin Ian Lio E-mail: joey\_lio@hotmail.com

### ABSTRACT

**Objective:** To understand the current status of alcohol use in Macau secondary students and to explore the relationship between alcohol use behaviour in the students and various family factors. At the same time, the study also aimed to analyze the predictive power of various family factors on alcohol use, to provide a reference for the formulation of strategies for prevention and control of alcohol use in Macau adolescents.

**Material and Methods:** The study was a cross-sectional study with data collection using a self-constructed questionnaire. The study samples were students in formal or vocational education in Macau in the school year 2020/2021, with randomization using randomized multistage stratified cluster sampling. A total of 939 valid samples were collected for data analysis. The distributions of the background variables and the behavior of alcohol use were analyzed using descriptive analysis, while Chi-square test (Chi-square), one-way analysis of variance (One-Way ANOVA), Kruskal-Wallis one-way analysis of variance, and logistic regression analysis were used for inferential statistical analysis.

**Conclusion:** There is an increased risk of current alcohol use in the students whose siblings also have a drinking habit, who have helped family members buy alcohol, and whose parents are more positive about drinking and who think their parents do not care about them. Intervention measures should be formulated targeting these factors.

**Keywords:** adolescent alcohol use, family relationship, Macau

### INTRODUCTION

According to the World Health Organization (WHO) data, harmful alcohol use is an important factor leading to disease burden in the world. In 2016, over three million people in the world died due to harmful alcohol use, summing up to 5.3% of the world's mortality rate. If we estimate the harmful effect of disability disability-adjusted life years, alcohol accounted for 5.1% of the world's disease and injury burden in the same year (1). Harmful alcohol use has severe effects to the users and the society as a whole.

In fact, alcohol is one of the most commonly abused substances among adolescents (2). The report by WHO in 2019 mentioned that 1.6 billion adolescents of age 15-19 years old were current alcohol users, which accounted for over 1/4 of all adolescents in that age group (1). During adolescence, young people go through a period of rapid change physically, psychologically, and socially. In this period, young people are curious about anything new, and they like excitement and are ready for adventures. This is the period when they start to try substances of abuse, including alcohol, cigarette, and illicit drugs.

In addition, developing brains can be easily affected by substances of abuse, this would have long term effect on the neurological development of the adolescents (3). The younger the age of first alcohol use, the more likely it is to develop alcohol dependence, illicit drug use and other high risk behaviors in adult lives (4). Thus, alcohol use in adolescents is an important public health problem that needs special attention.

Research data suggested that parents' attitude towards drinking, drinking behavior and parenting style is significantly correlated with adolescent alcohol use (5). According to the study, lower parents' educational level and lower parental monthly income would lead to higher rate of alcohol use in adolescents (6). On the other hand, family structure such as single parent family, parental comment of the children, and drinking in parents and siblings are also correlated with alcohol use in adolescents (7).

### Research Article

Received 11-09-2022

Accepted 21-09-2022

Available Online: 22-09-2022

Published 30-09-2022

Distributed under  
Creative Commons CC-BY-NC 4.0

### OPEN ACCESS



According to Macau Centre of Disease Control and Prevention, there has been a rising trend on alcohol use in Macau secondary students from 2012-2013 to the school year 2017-2018. These included the data on “ever drank alcohol”, “recent alcohol use of at least once in the past 30 days” and “ever binge drank in the past 30 days”, there were 2.7%, 0.5% and 2.5% increases respectively from 2012 to 2018 (8) (9).

This study sought to assess for the current condition of the behavior alcohol use in Macau secondary students and to examine the association of current alcohol use with different family factors among the students. We hypothesize that early alcohol use in the secondary students are related to family background and the students’ relationship with their parents. To our knowledge, this is the first study done in Macau on the association between family factors and alcohol use in secondary students. With the study, we aim to provide data that would be of use in the future for local Public Health strategy in managing adolescent alcohol use.

## MATERIAL AND METHODS

**General Study Information:** The Study is one part of a cross-sectional study named “Alcohol Use in Macau Secondary Students---a Study on Knowledge, Belief and Behavior of Alcohol Use and their Correlating Factors”. In the survey, students aged 11-20 were asked to fill in a questionnaire containing a total of 73 questions on 7 different parts. This included background information, knowledge about alcohol use, beliefs towards alcohol use, behaviors of alcohol use, family factors, peer factors and mental health condition. Parental consents were obtained for the participation of the students under the age of 18.

### Measures of Behavior of Alcohol Use

There were 10 questions in the questionnaire about alcohol use. The questions were:

1. Have you ever had any alcohol?
2. How old were you when you drank alcohol for the first time?
3. What was the reason for drinking alcohol for the first time?
4. In the past 1 month, how many days on average you have had alcohol?
5. In the past 1 month, have you ever had more than 5 glasses of alcohol in several hours?
6. In the past 1 month, what was the average amount of consumption (in alcohol unit) each time for the type of alcohol that you consumed most often?
7. Have you ever got drunk?
8. Have you ever had bad consequences due to drinking?
9. Where do you usually obtain alcohol?
10. Where do you usually drink?

For question number 6, we showed different types of glasses to demonstrate the alcohol unit, so that it is easier for the students to report the drinking amount by alcohol unit. For questions number 8-10, students could select more than one answer.

### Measures of Family Factors

Family factors included family structure, family interaction and parental factors.

The 9 questions on this part included “family members who live together”, “father and mother’s education level”, “father and mother’s work”, “drinking habit of the family members who live together”, “ever helped family members buying alcohol”, “perceived parental attitudes towards drinking”, “perceived parental care”, “relationship with parents” and “family financial situation”.

**Sampling, Sample Size and Recruitment Process:** In the survey, a total of 24789 secondary students from formal education and vocational education in Macau were eligible for randomization. It was calculated that at least 648 samples have to be included to achieve a confidence level of 99%, with a sampling error of <5%. Randomization was done by randomized multistage stratified cluster sampling on school and class bases. 974 students from 6 schools and 30 classes were invited to fill-in the questionnaires and 939 valid questionnaires were collected for data analysis.

**Data Analysis:** After questionnaire collection, valid questionnaires were coded, and data analysed using SPSS 26. Data analysis included:

1. Descriptive analyses such as average, median, percentage and standard deviation for the distributions of the variables
2. Using Chi-square test to analyse the difference between various family factors and the alcohol use behaviour in the samples
3. Using One-way ANOVA to check if there were significant differences in alcohol use behaviour with changes in different family factors. If there was significant difference, for variables with group number of <30, Kruskal-Wallis one way analysis of variance was used
4. Using logistic regression analysis to check if the changes in different family factors can predict current alcohol use (alcohol use of at least once within the past 30 days).

## RESULTS

### Demographic Data

Among the 939 adolescents who filled in the questionnaires and provided data for this study, 491 (52%) were males and 448 (48%) were females; the age range was 11-20 years old. Details are shown in table 1.

**Table 1.** Demographic data

Variable	Group	Number	%
Sex	M	491	52.3
	F	448	47.7
Class	Secondary 1	161	17.1
	Secondary 2	165	17.6
	Secondary 3	168	17.9
	Secondary 4	153	16.3
	Secondary 5	146	15.5
	Secondary 6	146	15.5
Age	11-12	100	10.7
	13-14	292	31.2
	15-16	315	33.7
	17-18	214	22.9
	19-20	15	1.6

## Behavior of Alcohol use

The results are as followed (see table 2):

1. About 70% of all students have used alcohol before.
2. The most common age of first drink of alcohol was "7-12 years old" (37.1%), followed by " $\leq$  6 years old" (27%) and "13-15 years old" (26.4%). Only 9.5% had their first alcoholic drink at 16 years old or after.
3. The most common reason for the first drink was "curiosity" (65%), followed by "family request" (19.1%), "friends' encouragement" (4.7%) and "others" (7.5%). "Being in a bad mood" (3.8%) was the least common reason for first drink.
4. Within the previous 1 month before the survey, about 17% of the students had engaged in binge drinking.
5. The most common place for obtaining alcohol was "home" (53.8%), followed by "shop" (45.5%), "restaurant" (32.6%), "pub or Karaoke" (23.1%) and "others" (5.4%).

6. Most students drank at home (66.5%). 41.9% drank in restaurant, 20.9% of them drank in friends' homes, 17.6% drank in pub or Karaoke, 7.5% drank outdoors such as on the street or in the park, and 5.4% drank in other places.
7. Beer was the most frequently consumed alcohol (64.2%), followed by red or white wine (17.7%), spirits 7.4), and sake (5.8%). Rice liquor was the least frequently consumed alcohol (4.8%).
8. 33% of the students were current alcohol users (use of alcohol of at least once within the past 30 days).
9. Within the past 1 year before the survey, 35.5% of the students had never taken any alcohol. The most common frequency of drinking was once or less than once per month (44.5%), followed by 2-4 times per month (15.5%). 2.7% of the students drank 2-3 times per week and 1.8% drank 4 times or more per week
10. In the study, an accident such as falling down (2.9%) was the most commonly reported bad consequence of drinking, followed by "absence from school" (2%), "led to a fight with others" (1.2%) and "led to a quarrel" (1.1%).

**Table 2.** Alcohol use behavior in the study samples

Behavior	Group	No	%
Ever drank alcohol	Yes	663	70.6
	No	276	29.4
Age when first drank			
$\leq$ 6 years old		177	27.0
7-12 years old		243	37.1
13-15 years old		173	26.4
$\geq$ 16 years old		62	9.5
Reason of first drink	Curiosity	432	65.0
	Family request	127	19.1
	Encouraged by friends	31	4.7
	Bad mood	25	3.8
	Others	50	7.5
Ever had 5 drinks or more in several hours in the past 1 month	Yes	114	17.1
	No	551	82.9
Ever binge drunk	Never	500	75.2
	Rarely	113	17.0
	Sometimes	42	6.3
	Always	2	0.3
	All the time	8	1.2
Usual place of obtaining alcohol (more than one answer allowed)	Shop (supermarket etc.)	303	45.5
	Pub or Karaoke	154	23.1
	Restaurant	217	32.6
	Home	358	53.8
	Others	36	5.4
Usual place of obtaining alcohol (more than one answer allowed)	Home	433	66.5
	Restaurant	279	41.9
	Pub or Karaoke	117	17.6
	Outdoors (park or street)	50	7.5
	Friend's home	139	20.9
	Others	36	5.4

**Table 2.** Alcohol use behavior in the study samples (cont.)

Behavior	Group	No	%
The alcohol most frequently consumed in the past 1 month	Beer	199	64.2
	Red wine or white wine	55	17.7
	Spirits	23	7.4
	Rice liquor	15	4.8
	Chinese liquor	0	0
	Sake	18	5.8
Current drinker	Yes	310	33.0
	No	629	67.0
Frequency of drinking in the past 1 month	No drinking	236	35.5
	≤1 time per month	295	44.5
	2-4 times per month	103	15.5
	2-3 times per week	18	2.7
	≥ 4 times per month	12	1.8
Bad consequences due to drinking (more than one answer allowed)	Accident (fall down etc.)	19	2.9
	Absence from school	13	2.0
	Fight with others	8	1.2
	Quarrel with others	7	1.1
	Others	9	1.4

In addition, we also calculated the average alcohol unit consumed each time the students drank in the previous 1 month before the study. In our study, the average alcohol unit consumed each time was 3.09 (S. D. 3) for all students. Male consumed more unit than female which was 3.47 alcohol unit (S.D. 3.43) each time. For female, the average alcohol unit consumed was 2.65 (S.D. 2.36). According to the US National Health Institute, heavy drinking is defined as > 4 alcohol unit per day in males of age ≤65 years old and >3 alcohol unit per day in female of any age (10). Considering the above-suggested alcohol limit, about 31% of male students in our study has had heavy drinking the corresponding figure for female students was 26.8% (see table 3).

**Table 3.** Heavy drinking in the past 1 month

Alcohol use	Group	Male		Female	Total
		No.	(%)		
Drinking exceeding suggested limit for heavy drinking in past 1 month	Yes	51	(31.3)	38(26.8)	89(29.2)
	No	112	(68.7)	104(73.2)	216(70.8)

**Table 4.** Chi-square test for family factors and alcohol use behavior in the study samples

Variables	Group	No.	Current drinker		$\chi^2$
			No. N (%)	Yes N (%)	
Parents divorced	Yes	102	66(64.7)	36(35.3)	0.34
	No	799	540(67.6)	259(32.4)	
Father's education level	Primary or below	97	63(64.9)	34(35.1)	0.08
	Secondary	297	197(66.3)	100(33.7)	
	Diploma	79	47(59.5)	32(40.5)	
	University or above	334	224(67.1)	110(32.9)	
Mother's education level	Primary or below	96	67(69.8)	29(30.2)	0.64
	Secondary	329	209(63.5)	120(36.5)	
	Diploma	90	49(54.4)	41(45.6)	
	University or above	311	217(69.8)	94(30.2)	
Parents' work condition	Both not on shift	464	301(64.9)	163(35.1)	1.31
	Either one on shift	197	131(66.5)	66(33.5)	
	Both on shift	119	84(70.6)	35(29.4)	
Father drinks	Yes	452	272(60.2)	180(39.8)	13.89***
	No	362	263(72.7)	99(27.3)	
Mother drinks	Yes	253	137(54.2)	116(45.8)	20.47***
	No	571	402(70.4)	169(29.6)	
Siblings drink	Yes	111	48(43.2)	63(56.8)	35.06***
	No	507	367(72.4)	140(27.6)	
Ever helped family members to buy alcohol	Yes	207	100(48.3)	107(51.7)	42.10***
	No	730	528(72.3)	202(27.7)	

Note: \*\*\* p < .001

### Family Factors and Alcohol Use in Secondary Students

We used Chi-square test to assess the relationship between different family factors and the behaviour of alcohol use in the students. As is shown in table 4, several factors are significantly correlated with current alcohol use in the students. These included “father with the habit of drinking” ( $\chi^2=13.89$ ,  $p < .001$ ), “mother with the habit of drinking” ( $\chi^2=20.47$ ,  $p < .001$ ), “drinking habit in siblings” ( $\chi^2=35.06$ ,  $p < .001$ ), “ever helped family members buying alcohol” ( $\chi^2=42.10$ ,  $p < .001$ ), “parents’ attitude towards drinking alcohol” ( $\chi^2=106.56$ ,  $p < .001$ ), “perceived parental care” ( $\chi^2=7.53$ ,  $p < .01$ ) and “relationship with parents” ( $\chi^2=8.24$ ,  $p < .01$ )

**Table 4.** Chi-square test for family factors and current alcohol use in the study samples (cont.)

Variables	Group	No.	Current drinker		$\chi^2$
			No N (%)	Yes N (%)	
Parents’ attitude towards drinking	Very much disagree	98	93(94.9)	5(5.1)	106.56***
	Disagree	187	150(80.2)	37(19.8)	
	Neutral	513	332(64.7)	181(35.3)	
	Agree	119	51(42.9)	68(57.1)	
	Very much agree	22	3(13.6)	19(86.4)	
Perceived parental care	Never care	9	7(77.8)	2(22.2)	7.53**
	Not care	35	17(48.6)	18(51.4)	
	In between	217	135(62.2)	82(37.8)	
	Care	445	301(67.6)	144(32.4)	
	Care very much	233	169(72.5)	64(27.5)	
Relationship with parents	Very bad	17	8(47.1)	9(52.9)	8.24**
	Bad	41	30(73.2)	11(26.8)	
	Average	285	170(59.6)	115(40.4)	
	Good	444	310(69.8)	134(30.2)	
	Very good	152	111(73.0)	41(27.0)	
Quarrel between parents	Never	211	144(68.2)	67(31.8)	1.18
	Rarely	327	227(69.4)	100(30.6)	
	Sometimes	292	184(63.0)	108(37.0)	
	Always	81	56(69.1)	25(30.9)	
	All the time	25	15(60.0)	10(40.0)	
Quarrel with parents	Never	134	95(70.9)	39(29.1)	3.02
	Rarely	326	221(67.8)	105(32.2)	
	Sometimes	357	241(67.5)	116(32.5)	
	Always	90	51(56.7)	39(43.3)	
	All the time	31	20(64.5)	11(35.5)	
Family financial condition	Poor	25	13(52.0)	12(44.0)	0.67
	Below average	105	71(67.6)	34(32.4)	
	Average	515	355(68.9)	160(31.1)	
	Above average	232	138(59.5)	94(40.5)	
	Good	61	51(83.6)	10(16.4)	

Note: \*\* $P < .01$ , \*\*\* $P < .001$

### Family Factors to Predict Current Alcohol Use in Secondary Students

With the results in table 4, all factors that were significantly correlated with current alcohol use in the students were put in logistic regression analysis (LRA) to assess if the factors can predict current alcohol use in the students. The factors include “father with the habit of drinking”, “mother with the habit of drinking”, “drinking habit in siblings”, “ever helped family members buying alcohol”, “parents’ attitude towards drinking”, “perceived parental care” and “relationship with parents”. Student’s reported status of current alcohol use (use of alcohol within the past 30 days) was the dependent variable and all other above-mentioned factors were independent variable.

As is shown in table 5, it is found that 4 factors are significantly associated with increasing risk of current alcohol use, these included “drinking habit in siblings”, “ever helped family members buying alcohol”, “parents’ attitude towards drinking alcohol and “perceived parental care”. The factor that is most predictive of the students’ current drinking behavior is “parents’ attitude towards drinking”, the more positive the parents are towards drinking, the more likely it is for the students to be current alcohol user, the risk is increased by 2 times. For students whose siblings also had drinking habits and those who had helped family members buy alcohol, the risk of being current alcohol drinkers was increased by 1.98 and 1.87 times, respectively. Finally, the risk of current alcohol drinking was decreased by 54% for the students who believed that their parents cared about them.

**Table 5.** LRA of current drinking behavior in the students relative to different family factors

Variables	B	S.E.	Wald	P	Exp(B)	95% Confidence Interval	
						Lower Limit	Upper Limit
Male	0.37	0.21	3.28	NS	1.45	0.97	2.17
Senior Secondary Classes (Secondary 4-6)	0.90	0.38	5.62	*	2.46	1.17	5.19
Age Group							
13-14Y	0.72	0.43	2.77	NS	2.04	0.88	4.74
15-16Y	0.10	0.51	0.04	NS	1.11	0.41	3.03
17-18Y	0.22	0.58	0.14	NS	1.24	0.40	3.87
19-20Y	-0.50	0.93	0.28	NS	0.61	0.10	3.77
Father with drinking habit	-0.03	0.23	0.02	NS	0.97	0.62	1.52
Mother with drinking habit	0.40	0.24	2.70	NS	1.49	0.93	2.39
Siblings with drinking habit	0.68	0.28	6.07	*	1.98	1.15	3.40
Ever helped family buying alcohol	0.62	0.24	6.92	**	1.87	1.17	2.97
Parents positive about drinking	0.71	0.15	24.00	***	2.04	1.53	2.70
Think parents care about them	-0.61	0.30	4.24	*	0.54	0.30	0.97
Good relationship with parents	-0.26	0.27	0.90	NS	0.77	0.45	1.32

Note: \*P < .05, \*\*P < .01, \*\*\*P < .001, NS not significant

## DISCUSSION

In our study, about one-third of the secondary students reported being alcohol users. This is a 5% increase compared to previous Macau data in 2013 and 2018 (8-9) and also 10% higher than that of similar study in China (11). For binge drinking, our results of 17% in the students also suggested an increasing trend compared to previous data (8-9). Alcohol use in adolescents, especially harmful alcohol use including frequent alcohol use and binge drinking can lead to severe harmful effects (12). Aside from the well-known physical harmful effects such as acute intoxication, cancer, damage to the liver, gastrointestinal and cardiovascular system etc. (13), it is also related to traffic accidents (14). Study has shown that the rate of traumatic brain injury leading to hospitalization is 50% more in child and adolescents who are current drinker compared to non-drinker (15). In this case, our results of rising trend in the rate of current drinker and binge drinker in the adolescents should be given serious attention.

In fact, early alcohol use in adolescents is especially harmful due to its effect on neurological development. During this period of rapid growth, the human brain, especially the hippocampus, is particularly vulnerable to alcohol damage (16). Long term heavy drinking in adolescents can be fatal to the neurons, inhibiting tissue growth in neurological system and may lead to cognitive and emotional dysfunction (17). Alcohol has also been shown to affect memory more severely in adolescents than adults (18). In our study, over 70% of the secondary students have tried alcohol before, this is 20% higher than that suggested by similar studies in China (11, 20). Among the students have tried alcohol, 60% of them started using alcohol before 13 years old, this is also 2 times higher than 2018 statistics (9). It is well known that early alcohol use would lead to the more severe problem of alcohol and other drug abuses in the long term (20-23), thus strategies should be implemented on the promotion of alcohol harmful effects to prevent and decrease alcohol use in the students, the earlier the better.

In order to tackle the problem of alcohol use in students, it is important to understand their reasons for first use. In our study, most secondary students reported first use of alcohol due to “curiosity”, however “family request” was also the reason for nearly one-fifth of the students. These results suggested that health promotion to increase awareness of alcohol harmful effects is essential, not only education provided directly to the students but also health promotion through advertisements on mass media, on the internet, and popular social networking system. Other ways to deal with the problem of early alcohol use is through rules and regulations that prevent easy access to alcohol. In our study, the common places of obtaining alcohol and alcohol consumption are in the restaurants, pubs and karaoke, so it is important to have rules and regulations which forbid selling alcohol to all underage citizens.

Considering family influence being an important risk factor for adolescent alcohol use, our study looked into the correlation between various family factors and alcohol use in the secondary students. In our study, 4 family factors were predictive of current alcohol use in the secondary students, namely “drinking habit in siblings”, “ever helped family members buying alcohol”, “parents’ attitude towards drinking” and “perceived parental care”. These results were similar to previous studies done in Taiwan (5, 7). However, the factors that were shown to be related to alcohol use in previous studies including family structure, parental education level, family financial condition were not related to current alcohol use (6-7). We believe that the current low alcohol tax in Macau maybe one explanation for the reason why family financial condition was not significantly related to alcohol use in Macau secondary students. This suggested that increasing alcohol tax can be one way of decreasing alcohol use in the adolescents since this should decrease the availability of alcohol to the students who have less money to spend.

In our study, parents' attitude towards alcohol drinking is most predictive of the students' current alcohol use. Current alcohol use was reported more in the students whose parents were positive attitude toward drinking. This result does correlate with our other finding that "family request" was the second most common reason for the students' first use of alcohol. It is likely that those parents who think that alcohol can be enjoyable, who enjoy drinking themselves or who believe that alcohol is for celebration in the family would ask the students to drink with them or try alcohol at earlier age, leading to the development of long-term drinking habit. Possibly related to parental attitude towards alcohol drinking is the factor of "ever helped family members buying alcohol". Parents who are more positive about drinking would more likely to ask their children to help them to buy alcohol. The increased risk can be explained by increased exposure to alcohol, so there were more temptations to try alcohol in the first place, leading to an increased likelihood of being current alcohol user.

Even though drinking habit in all family members was significantly related to current alcohol use in the students, there was an increased risk in current alcohol use only for the students whose siblings also had drinking habit. This suggested that the students are more easily influenced by their similar age siblings than their parents. This is understandable because adolescents likely want to be independent from their parents while siblings' behaviour probably has a similar effect as that of the well-known peer effect on alcohol use (24). Finally, though "perceived relationship with parents" was not predictive of current alcohol use in the students, the students who believed that their parents care about them were less likely to be current alcohol users. We think this may suggest less emotional problem in the students with more care from parents and thus less use of alcohol as an escape from the emotional issues. As is previously shown in different studies, alcohol use in adolescents is associated with various different psychiatric and emotional problem (25-27)

Summing up the study findings, there are several suggestions in terms of decreasing alcohol use in the secondary students:

1. Health education and health promotion target younger students to prevent early alcohol use.
2. Health promotion campaign to increase public knowledge about harmful alcohol effects, especially to parents, building correct attitude towards alcohol drinking, aiming to decrease the students' exposure to alcohol in the family.
3. Implementation of rules and regulation to forbid selling and provision of alcohol to underage students.
4. Increase alcohol tax, making alcohol less avoidable by the students.
5. Social service and support to help parents to build better relationships with the students

There are several limitations from our study. Firstly, this is a cross-sectional study which only showed correlations, it cannot explain the cause and effect relationship of the family factors with current alcohol use in the students. Secondly, the methodology of a survey by self-reported questionnaire has the potential of recall bias, leading to deviation from real-life situations.

Future studies should consider the methodology of longitudinal studies and qualitative studies to have an in-depth understanding of the issue. Finally, due to the limitation of the scope of the study, we didn't go into deeper analyses of each of the individual family factors. Future studies should consider to include parents' report instead of relying only on that of the students. More detailed assessment of student's alcohol use should also be conducted using validated assessment tools such as those used for alcohol use disorder.

## CONCLUSION

The study is conducted on secondary students in formal education in Macau. The results can help in understanding the current situation of alcohol use in the students and the relationship with various family factors. The study design specifically targeted previous research results in Macau and various neighboring regions for the purpose of observing changes in the trend of alcohol use and for comparison of correlation between different family factors and current alcohol use.

Our findings have shown that "drinking habit in siblings", "ever helped family members buying alcohol", "parents' positive attitude towards drinking alcohol" and "thinking that their parents do not care about them" are associated with significant risk for current alcohol use in the secondary students, with about 2 times increased risk compared to students without the condition. There is an increasing trend of alcohol use in all secondary students as well as early alcohol use in younger students in Macau. Thus, strategies to decrease alcohol use in the secondary students, some of which target specific family factors, should be implemented.

**Acknowledgments:** The authors would like to acknowledge the support for the study from the department of Psychiatry of the Centro Hospitalar Conde de São Januário, Macau.

**Conflict of interest:** The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. This research did not receive and specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Author Contributions:** **TFN, LIL:** Study design, Literature review, Data collection and processing, Patient therapy, Analysis **LIL:** Data collection, Writing, Revisions

**Ethical approval:** All procedures performed in studies involving human participants were in accordance with the institutional and/or national research committee's ethical standards and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

## REFERENCES

1. Global status report on alcohol and health 2018: World Health Organization [Report on the Internet]. World Health Organization; [cited 2022 July 22]. Available from: <https://www.who.int/publications/item/9789241565639>
2. Anderson, P. & Baumberg, B. "Alcohol in Europe-public health perspective: report summary." Drugs: education, prevention and policy. [Internet] 2006 [cited 2022 July 22]; 13(6) 483-488. Available from: <https://www.tandfonline.com/doi/abs/10.1080/09687630600902477?journalCode=idep20>

3. Addictive behaviors and psychosocial correlates among Chinese adolescents in Macau Research Report 2017 [Report on the Internet]. The Bosco Youth Service Network in Macau and the Tung Wah Group of Hospitals; [cited 2022 Aug 9]. Available from: The Bosco Youth Service Network in Macau and the Tung Wah Group of Hospitals
4. Johannessen, E. L., Andersson, H. W., Bjørnsgaard, J. H., & Pape, K. Anxiety and depression symptoms and alcohol use among adolescents-a cross sectional study of Norwegian secondary school students. *BMC Public Health*. [Internet] 2017 [cited 2022 July 22]; 17(1), 494. Available from: <https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/2457637>
5. LIN, D. H, FANG X. Y., & MAO R. The Effect of Parental and Peer Factors on Adolescent Drinking Behavior. *Psychological Development and Education*. [Internet]2008[cited 2022 Aug 8]; 24(3),36-42. Available from: <http://www.devpsy.com.cn/EN/Y2008/V24/I3/36>
6. LIN M. X. A Study on Risk Behaviors Related to Health and Probe into the Relative Factors among Adolescents in Taiwan. [Dissertation] National Taiwan Normal University; 2007
7. Liou, M. Y. & Chou, P. Prevalence and Related Factors of Alcohol use Among Adolescent Students in Taiwan. *Taiwan Journal of Public Health*. [Internet]2001[cited 2022 Aug 8]; 20(2),143-152. Available from: <https://scholar.nycu.edu.tw/en/publications/prevalence-and-related-factors-of-alcohol-use-among-adolescent-stu>
8. Núcleo de Prevenção de Doenças Crónicas e Promoção de Saúde, Macau CDC Study on Health Behavior in Macau Secondary Students in School Year 2012-2013. [Report on the Internet]. Servico de saude Macau; [cited 2022 March 11]. Available from: <https://www.ssm.gov.mo/cpc/monitor>
9. Núcleo de Prevenção de Doenças Crónicas e Promoção de Saúde, Macau CDC Study on Health Behavior in Macau Secondary Students in School Year 2017-2018. [Report on the Internet]. Servico de saude Macau; [cited 2022 March 11]. Available from: <https://www.ssm.gov.mo/cpc/monitor>
10. Niaaa.nih.gov [Internet] Drinking Levels Defined [cited 2022 Aug 08]. Available from: <https://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/moderate-binge-drinking>
11. Ho, D., Huang, R., Wang, M., Lo, W., & Lam, T. (2019). Adolescent alcohol drinking in Hong Kong: a school-based survey. *Hong Kong medical journal*. [Internet] 2019 [cited 2022 July 22]; 25 Suppl 3(1):13-15. Available from: <https://pubmed.ncbi.nlm.nih.gov/30792366/>
12. Inchley, J. C., Currie, D. B., Vieno, A., Torsheim, T., Ferreira-Borges, C., Weber, M. et al. Adolescent alcohol-related behaviours: trends and inequalities in the WHO European Region, 2002–2014: observations from the Health Behaviour in School-aged Children (HBSC) WHO collaborative cross-national study. [Report on the Internet]. World Health Organization. Regional Office for Europe. [cited 2022 July 22]. Available from: <https://apps.who.int/iris/handle/10665/342239>
13. Barclay, G., Barbour, J., Stewart, S., Day, C., & Gilvarry, E. Adverse physical effects of alcohol misuse. *Advances in Psychiatric Treatment*. [Internet] 2008 [cited 2022 July 22]; 14(2), 139-151. Available from: <https://www.cambridge.org/core/journals/advances-in-psychiatric-treatment/article/adverse-physical-effects-of-alcohol-misuse/712D871F7C2B7B1C1285A6359189EA31>
14. Perkins, H. W. Surveying the damage: a review of research on consequences of alcohol misuse in college populations. *Journal of Studies on Alcohol, supplement*. [Internet] 2002 [cited 2022 July 22]; (14), 91-100. Available from: <https://www.jsad.com/doi/abs/10.15288/jsas.2002.s14.91>
15. Eskander, N., Prabhudesai, S., Imran, H., Amuk, O. C., & Patel, R. S. Alcohol use disorder increases risk of traumatic brain injury-related hospitalization: insights from 3.8 million children and adolescent inpatients. *Cureus*. [Internet] 2020. [cited 2022 July 22]; 12(6). Available from: <https://www.cureus.com/articles/34304-alcohol-use-disorder-increases-risk-of-traumatic-brain-injury-related-hospitalization-insights-from-38-million-children-and-adolescent-inpatients>
16. Welch, K. A., Carson, A., & Lawrie, S. M. Brain structure in adolescents and young adults with alcohol problems: systematic review of imaging studies. *Alcohol and alcoholism*. [Internet] 2013. [cited 2022 July 22]; 48(4), 433-444. Available from: <https://academic.oup.com/alc alc/article/48/4/433/534074>
17. Guerri, C., & Pascual, M. (2010). Mechanisms involved in the neurotoxic, cognitive, and neurobehavioral effects of alcohol consumption during adolescence. *Alcohol*. [Internet] 2010. [cited 2022 July 22]; 44(1), 15-26. Available from: <https://pubmed.ncbi.nlm.nih.gov/20113871/>
18. Zeigler, D. W., Wang, C. C., Yoast, R. A., Dickinson, B. D., McCaffree, M. A., Robinowitz, C. B. et al. The neurocognitive effects of alcohol on adolescents and college students. *Preventive medicine*. [Internet] 2005 [cited 2022 July 22]; 40(1), 23-32. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S0091743504002658>
19. LU S. J. Drinking Behavior Survey and Control Strategy Study in Adolescents in Six Chinese Cities [Dissertation]. Chinese Center for Disease Control and Prevention; 2015.
20. Babor, T. F., Hofmann, M., DelBoca, F. K., Hesselbrock, V., Meyer, R. E., Dolinsky, Z. S., & Rounsville, B. Types of alcoholics, I: Evidence for an empirically derived typology based on indicators of vulnerability and severity. *Archives of general psychiatry*. [Internet] 1992 [cited 2022 July 22]; 49(8), 599-608. Available from: <https://jamanetwork.com/journals/jamapsychiatry/article-abstract/495821>
21. Hughes, T., McCabe, S. E., Wilsnack, S. C., West, B. T., & Boyd, C. J. Victimization and substance use disorders in a national sample of heterosexual and sexual minority women and men. *Addiction*. [Internet] 2010 [cited 2022 July 22]; 105(12), 2130-2140. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1360-0443.2010.03088.x>
22. Grant, J. D., Scherrer, J. F., Lynskey, M. T., Lyons, M. J., Eisen, S. A., Tsuang, M. T. et al. Adolescent alcohol use is a risk factor for adult alcohol and drug dependence: evidence from a twin design. *Psychological Medicine*. [Internet] 2006 [cited 2022 July 22]; 36(1) :109 – 118. Available from: <https://www.cambridge.org/core/journals/psychological-medicine/article/abs/adolescent-alcohol-use-is-a-risk-factor-for-adult-alcohol-and-drug-dependence-evidence-from-a-twin-design/CF214B68973E7743918599866FAE097C>
23. DeWit, D. J., Adlaf, E. M., Offord, D. R., & Ogborne, A. C. Age at first alcohol use: a risk factor for the development of alcohol disorders. *American Journal of Psychiatry*. [Internet] 2000 [cited 2022 July 22]; 157(5), 745-750. Available from: <https://ajp.psychiatryonline.org/doi/full/10.1176/appi.ajp.157.5.745>
24. Kuntsche, E., Rehm, J., & Gmel, G. Characteristics of binge drinkers in Europe. *Social Science & Medicine*. [Internet] 2004 [cited 2022 July 22]; 59(1), 113-127. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S0277953603005458>

25. Collishaw, S., Maughan, B., Goodman, R., & Pickles, A. Time trends in adolescent mental health. *Journal of child psychology and psychiatry*. [Internet] 2004 [cited 2022 July 22]; 45(8), 1350-1362. Available from: <https://acamh.onlinelibrary.wiley.com/doi/abs/10.1111/j.1469-7610.2004.00335.x>
26. Simpson, K., Janssen, I., Boyce, W. F., & Pickett, W. Risk taking and recurrent health symptoms in Canadian adolescents. *Preventive medicine*. [Internet] 2006 [cited 2022 July 22]; 43(1), 46-51. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S0091743506001010>
27. Tarter, R. E., Kirisci, L., Feske, U., & Vanyukov, M. Modeling the pathways linking childhood hyperactivity and substance use disorder in young adulthood. *Psychology of Addictive Behaviors*. [Internet] 2007 [cited 2022 July 22]; 21(2), 266. Available from: <https://psycnet.apa.org/record/2007-08148-019>

Copyright © 2022 The Author(s); This is an open-access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), (CC BY NC) which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. International Journal of Medical Science and Discovery.