

## STUDENTS IN DANGER: BINGE DRINKING BEHAVIOUR AND ASSOCIATED FACTORS IN HUNGARY

### ŠTUDENTI V NEVARNOSTI: OPIJANJE IN POVEZANI DEJAVNIKI NA MADŽARSKEM

Anita LUKÁCS<sup>1,2\*</sup>, Andrea SZABÓ<sup>1</sup>, Edina HORVÁTH<sup>1</sup>, Zsuzsanna MÁTÉ<sup>1</sup>, Csaba ERDŐS<sup>1</sup>, Regina MOLNÁR<sup>1</sup>, Edit PAULIK<sup>1</sup>

<sup>1</sup>University of Szeged, Faculty of Medicine, Department of Public Health, Dóm Tér 10, 6720 Szeged, Hungary

<sup>2</sup>University of Szeged, Faculty of Science and Informatics, Department of Physiology, Anatomy and Neuroscience, Közép fasor 52, 6726 Szeged, Hungary

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#### ABSTRACT

#### Keywords:

alcohol drinking, binge drinking, risk factors, students, academic performance, illicit drugs, education

**Introduction:** Among young adults, high rates of binge drinking were observed in certain European countries. Binge drinking is associated with several health problems (unplanned pregnancy, HIV infections, problems with memory, and injuries). The aim of this questionnaire-based study was to measure the frequency of binge drinking and its association with sociodemographic, familial, lifestyle factors and school performance among secondary and university students (n=2449) in Csongrád County, Hungary.

**Methods:** In this cross-sectional study the students' sociodemographic data, parents' educational and economic level, and students' academic performance and self-reported use of tobacco, drugs, and alcohol were collected by a questionnaire. Descriptive statistics and multivariable binary logistic regression analyses were applied using SPSS 24.0 software.

**Results:** Altogether 2449 Hungarian secondary school students and university students participated in the study. Nearly one-third of the students were classified as binge drinkers, significantly more male university students. Tobacco or illicit drug use resulted in higher odds of being a binge drinker in both subgroups. Poor school performance and binge drinking were significantly correlated especially among secondary school students.

**Conclusions:** Targeting alcohol, tobacco, and illicit drug use together, including education, parent interventions, and public health policies, are crucial in the prevention of possible serious consequences.

#### IZVLEČEK

#### Ključne besede:

pitje alkohola, opijanje, dejavniki tveganja, dijaki, študenti, učna uspešnost, prepovedane droge, izobraževanje

**Uvod:** V nekaterih evropskih državah so bili ugotovljeni visoki deleži opijanja med mladimi odraslimi. Opijanje je povezano z več zdravstvenimi težavami (nenačrtovana nosečnost, okužba z virusom HIV, težave s spominom in poškodbe). Cilj te raziskave na podlagi vprašalnika je bil izmeriti pogostost opijanja ter njegove povezave s socialno-demografskimi in družinskimi dejavniki ter dejavniki življenjskega sloga in šolskim uspehom med dijaki in študenti (n = 2.449) v županiji Csongrád na Madžarskem.

**Metode:** V tej presečni raziskavi so bili z vprašalnikom zbrani socialno-demografski podatki dijakov in študentov, stopnja izobrazbe in ekonomski položaj staršev, učna uspešnost dijakov in študentov ter uporaba tobaka, drog in alkohola na podlagi samoporočanja. S programsko opremo SPSS 24.0 sta bili uporabljeni opisna statistika in binarna logistična regresija.

**Rezultati:** V tej raziskavi je skupaj sodelovalo 2.449 madžarskih dijakov in študentov. Ugotovljeno je bilo, da se tretjina dijakov in študentov opija, od tega precej več moških študentov. Uporaba tobaka ali prepovedanih drog pomeni večjo verjetnost, da se anketiranci v obeh podskupinah opijajo. Slab šolski uspeh in opijanje sta bila bistveno povezana zlasti med dijaki.

**Zaključki:** Skupno obravnavanje uporabe alkohola, tobaka in prepovedanih drog, vključno z izobraževanjem, posredovanjem staršev in javnozdravstvenimi politikami, je ključno pri preprečevanju morebitnih resnih posledic.

\*Corresponding author: Tel. + 36 204 303 525; E-mail: lukacs.anita.81@gmail.com

## 1 INTRODUCTION

The worldwide prevalence of binge drinking (BD) decreased from 22.6% in 2000 to 18.2% in 2016. In the European Region, however, it remains a huge public health problem with high prevalence both in the general (26.5%) and young populations (33.9% among 20-24 years old) (1). In several European countries, epidemiological data show a continuous increase in alcohol consumption up to intoxication in adolescents and young adults (2, 3). According to the latest the European School Survey Project on Alcohol and Other Drugs (ESPAD) report, one-third of the European 15-16-year-old students (33%) reported early (at the age of 13 or younger) alcohol use. Moreover, 34% of the students, more boys than girls, reported heavy episodic drinking (HED). From Hungary, higher rates of early alcohol use (42%) and HED (41%) compared to the European average were reported (4).

HED or BD is a particular pattern of alcohol consumption, which “typically occurs after four drinks for women and five drinks for men” (5). The definition of Substance Abuse and Mental Health Services Administration (SAMHSA) for binge drinking differs for males and females as BD is defined as 5 or more alcoholic drinks for males or 4 or more alcoholic drinks for females on the same occasion on at least 1 day in the past month (6).

The negative health consequences of excessive alcohol consumption: cancers, cardiovascular diseases, liver cirrhosis, nerve damage, HIV infection, or death have been reported several times (1, 7).

For adolescents and young adults, the consequences of BD tend to be more common than adults, and BD can be associated with special negative health effects, such as hangover (headache and upset stomach) (8), increased risk of unplanned, unprotected sex (9) with consequent unplanned pregnancies, and/or sexually transmitted diseases (STD). BD was also related to higher rates of alcohol-related injuries (10) and violence (11), some of which were more common in boys, for example “physical fights” and “trouble with the police”, but both boys and girls who drank alcohol on more than three to five days in the last 30 days were involved in other problems, e.g. below average academic achievement (12). Drinking alcohol during adolescence can cause structural and functional alterations in the central nervous system, including the hippocampus, the region of the brain that plays a key role in learning and memory. BD university students remembered fewer words in the interference list, performed worse in the logical memory subtest (13) - particularly the extreme binge drinkers (10+ drinks/occasion) (14) - and experienced episodic memory deficits (15).

The worst outcome of heavy alcohol use (blood alcohol concentration equal to or higher than 2 g/kg detected during autopsy) could be lethal, particularly in young males (16).

For the prevention of serious health effects in young adults, first the potential - sociodemographic, educational, economic, and lifestyle - risk factors, potentially contributing to increased alcohol use, are to be clarified. The family plays a central role in the use of alcohol in children; there is an association between the quality of the parent-child relationship and parental attitudes to alcohol and the use of alcohol by the child. Pisinger's study showed that young people with perceived parental alcohol problems binge drink more frequently (17), but generally, the relationship with parents seems to be related more strongly to life-long alcohol use than to recent alcohol use and BD (18). Family structure is also an important determinant factor in alcohol use during schooling years; adolescents living in one-parent households are more likely to be involved in the risky use of alcohol (19). Regarding educational status, a Norwegian study found that higher levels of parental education are associated with an increased risk of BD (20). A family's lower socioeconomic status (SES) has also been shown to result in higher risk of excessive drinking among adolescents (21).

Harmful alcohol use is often associated with risk behaviours such as use of tobacco or other, illicit drugs. In several countries, a significant positive correlation of smoking with a higher frequency and volume of alcohol drinking and BD was found (22). Drinking alcohol was assessed as a risk factor for illegal drug use in another research (23). Alcohol use and its relation to determinant factors have been amply studied among university students in Western European countries and in the USA, but less is known about secondary school/university students in Eastern Europe.

To the best of our knowledge, there is no study yet to have investigated the relationship between BD and several factors in details among secondary school/university students in Hungary.

The aim of this study was to measure the frequency of BD and its association with sociodemographic (age and gender), familial (parental educational level and economic status of the family), and lifestyle factors (smoking and use of illicit drugs), as well as school performance, in the groups of Hungarian secondary school students and university students separately.

## 2 METHODS

### 2.1 Study design and participants

Hungarian secondary school students (14-18 years old) and university students (19-27 years old) were included in this study, attending schools in the southern part of Hungary in Csongrád County. There were altogether 43 secondary schools (secondary grammar schools, technical schools, vocational schools) and 12 faculties from the University of Szeged in this county.

It was attempted to include 1000 secondary school students and 1500 university students. In the case of secondary schools, 12 schools were selected, representing all types of schools in the county, and then one class per grades 1-4 from each school were chosen. The university students were selected from the health-science-oriented faculties; the selection unit was the group (university students learn in groups, 14-20 students belong to one group). Every second group per years 1-5 was randomly invited to take part in our study. All students (or their parents for students under 18) were informed about the aim of study and written informed consent was obtained from everybody. The participation was voluntary and anonymous. The number of the students who did not answer was negligible.

## 2.2 Data collection

The data were collected in the first part of the academic year of 2015-2016, from a cross-sectional study, which was carried out via self-administered questionnaires. The questionnaire consisted of questions tested previously in several national and international surveys. Some questions were adapted from the Alcohol Use Disorders Identification Test (AUDIT), which has become the world's most widely used alcohol screening instrument. It is currently available in Hungarian.

In this study, 4 parts of this 11-part questionnaire were evaluated. The evaluated parts of the questionnaire collected the students' personal data (age and gender), the parents' educational level (*low, medium, or high*), and the family's economic status (*very low, low, average, good, or very good*). We also asked the students about the use of tobacco, alcohol, and illicit drugs.

Regarding the use of tobacco, occasional and regular *smokers* were classified as smokers, and those who reported no smoking or earlier smoking were classified as *non-smokers*. Self-reported school performance of the students (*poor, medium, or good*) was also recorded.

The students' alcohol drinking was classified using the definition of SAMHSA (6). A student was classified as a *binge drinker* if they consumed five or more drinks at one time (boys), or four or more drinks at one time (girls) at least once in the last 30 days. If they drank less alcohol, they were classified as a *non-binge drinker*.

We were also interested in lifetime illicit drug use, and whether the student had ever used any illicit drug (ecstasy, speed, depressants, alcohol combined with depressants, volatile solvents, or herbal drugs), they were classified an *illicit drug user*.

## 2.3 Statistical analysis

A chi-square test was performed in descriptive statistical analysis, and the variables were presented as frequencies (n) and proportions (%). The associations between various variables (age, gender, parents' educational level, economic status of the family, school performance, smoking status, and illicit drug consumption) and BD were measured using univariable (one dependent variable and one independent variable) and multivariable binary logistic regression models (one dependent variable and more than one independent variables). BD (yes-no) was the dependent variable, while age, gender, parents' educational level, economic status of the family, school performance, smoking status, and illicit drug consumption were the independent variables. Age was measured as a continuous variable. The determination of the logistic regression model was based on the Hosmer-Lemeshow goodness of fit tests. The measures of association were presented as unadjusted odds ratios (OR) or adjusted odds ratios (AOR) (which takes into account the effect due to all the additional variables included in the analysis), and 95% confidence intervals (95% CI) with p-values. A p-value lower than 0.05 was considered statistically significant. Statistical analysis was performed by using the SPSS 24.0 software.

## 3 RESULTS

The study population of 2449 Hungarian students consisted of 864 secondary school and 1585 university students. Table 1 shows the students' characteristics. In the group of secondary school students, the male-female ratio was almost equal (45.0%-55.0%), in contrast there were significantly ( $p<0.001$ ) more females (74.8%) in the group of university students. The majority of parents' educational levels were low (father) or medium (mother) for secondary school students and high among university students, and the difference was significant between the two groups ( $p<0.001$ ). The families' economic statuses were mostly good (secondary school students) or average (university students). Students' school performance was good in most cases in both groups. Among all participants who responded to the specific questions regarding alcohol, tobacco, and other drug use, 30.5% were classified as binge drinkers, 15.8% reported smoking, and 13.0% have never used any illicit drug. Among university students we found significantly ( $p<0.001$ ) more binge drinkers than among secondary school students (37.2% vs. 19.0%). Binge drinkers were more common among male students both in secondary school (males: 21.5%, females: 17.0%) and university students (males: 52.0%, females: 32.2%). Smoking was the most common among male university students (23.3%), and they were also most affected by illicit drug use (19.3%) (Table 1).

Table 1. Sociodemographic characteristics of students.

| Characteristics                              | Secondary school students (14-18 years) |             | University students (19-27 years) |             |
|--|---|-------------|-----------------------------------|-------------|
|  | Frequency (n)                           | Percent (%) | Frequency (n)                     | Percent (%) |
| <b>Total number</b>                          | 864                                     | 35.3        | 1585                              | 64.7        |
| <b>Gender***</b>                             |   |             |                                   |             |
| male   | 389                                     | 45.0        | 399                               | 25.2        |
| female                                       | 475                                     | 55.0        | 1186                              | 74.8        |
| <b>Father's highest educational level***</b> |   |             |                                   |             |
| low  | 358                                     | 44.0        | 469                               | 30.3        |
| medium                                       | 250                                     | 30.7        | 452                               | 29.2        |
| high   | 206                                     | 25.3        | 625                               | 40.4        |
| <b>Mother's highest educational level***</b> |   |             |                                   |             |
| low  | 236                                     | 28.3        | 253                               | 16.2        |
| medium                                       | 313                                     | 37.5        | 539                               | 34.5        |
| high   | 285                                     | 34.2        | 772                               | 49.3        |
| <b>Economic status of the family</b>         |   |             |                                   |             |
| very low                                     | 6                                       | 0.7         | 16                                | 1.0         |
| low  | 36                                      | 4.3         | 77                                | 4.9         |
| average                                      | 348                                     | 41.1        | 728                               | 46.0        |
| good   | 411                                     | 48.5        | 695                               | 43.9        |
| very good                                    | 46                                      | 5.4         | 66                                | 4.2         |
| <b>School performance*</b>                   |   |             |                                   |             |
| poor   | 56                                      | 6.5         | 67                                | 4.3         |
| medium                                       | 276                                     | 32.1        | 464                               | 29.5        |
| good   | 527                                     | 61.4        | 1043                              | 66.3        |
| <b>Binge drinking***</b>                     |   |             |                                   |             |
| <i>Total</i>                                 | 162                                     | 19.0        | 585                               | 37.2        |
| male   | 83                                      | 21.5        | 206                               | 52.0        |
| female                                       | 79                                      | 17.0        | 379                               | 32.2        |
| <b>Smoking***</b>                            |   |             |                                   |             |
| <i>Total</i>                                 | 101                                     | 11.7        | 287                               | 18.1        |
| male   | 40                                      | 10.3        | 93                                | 23.3        |
| female                                       | 61                                      | 12.8        | 194                               | 16.4        |
| <b>Drug consumption***</b>                   |   |             |                                   |             |
| <i>Total</i>                                 | 57                                      | 7.0         | 250                               | 16.2        |
| male   | 26                                      | 7.0         | 74                                | 19.3        |
| female                                       | 31                                      | 7.0         | 176                               | 15.2        |

Result of chi-square tests: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001

Table 2 shows the univariable and multivariable logistic regression models of BD onset with different variables.

**Table 2.** Factors associated with binge drinking among students in Hungary (univariable and multivariable logistic regression analyses).

| Independent variables                     | Univariable                             |                  |                                   |                  | Multivariable                           |                  |                                   |                  |
|---|---|------------------|-----------------------------------|------------------|---|------------------|-----------------------------------|------------------|
|   | Secondary school students (14-18 years) |                  | University students (19-27 years) |                  | Secondary school students (14-18 years) |                  | University students (19-27 years) |                  |
|   | OR (95% CI)                             | p-value          | OR (95% CI)                       | p-value          | AOR (95% CI)                            | p-value          | AOR (95% CI)                      | p-value          |
| <b>Age</b>                                | <b>1.60</b><br>(1.37-1.86)              | <b>&lt;0.001</b> | <b>0.90</b><br>(0.86-0.95)        | <b>&lt;0.001</b> | <b>1.44</b><br>(1.19-1.75)              | <b>&lt;0.001</b> | <b>0.88</b><br>(0.82-0.93)        | <b>&lt;0.001</b> |
| <b>Gender</b>                             |   |                  |                                   |                  |   |                  |                                   |                  |
| Male                                      | 1.34<br>(0.95-1.89)                     | 0.096            | <b>2.28</b><br>(1.81-2.88)        | <b>&lt;0.001</b> | 1.42<br>(0.93-2.15)                     | 0.104            | <b>2.05</b><br>(1.59-2.65)        | <b>&lt;0.001</b> |
| Female                                    | ref.                                    |                  | ref.                              |                  | ref.                                    |                  | ref.                              |                  |
| <b>Father's highest educational level</b> |   |                  |                                   |                  |   |                  |                                   |                  |
| low                                       | ref.                                    |                  | ref.                              |                  | ref.                                    |                  | ref.                              |                  |
| medium                                    | 1.04<br>(0.70-1.55)                     | 0.845            | <b>1.38</b><br>(1.05-1.81)        | <b>0.020</b>     | 1.12<br>(0.67-1.89)                     | 0.662            | 1.32<br>(0.97-1.81)               | 0.078            |
| high                                      | 0.66<br>(0.41-1.05)                     | 0.079            | 1.24<br>(0.97-1.60)               | 0.092            | 0.78<br>(0.41-1.49)                     | 0.455            | 1.01<br>(0.73-1.41)               | 0.946            |
| <b>Mother's highest educational level</b> |   |                  |                                   |                  |   |                  |                                   |                  |
| low                                       | ref.                                    |                  | ref.                              |                  | ref.                                    |                  | ref.                              |                  |
| medium                                    | 1.31<br>(0.86-2.02)                     | 0.211            | 1.04<br>(0.76-1.42)               | 0.825            | <b>2.02</b><br>(1.15-3.57)              | <b>0.015</b>     | 0.85<br>(0.59-1.23)               | 0.398            |
| high                                      | 0.95<br>(0.60-1.50)                     | 0.825            | <b>1.36</b><br>(1.01-1.84)        | <b>0.042</b>     | 1.54<br>(0.80-2.99)                     | 0.199            | 1.12<br>(0.76-1.65)               | 0.572            |
| <b>Economic status of the family</b>      |   |                  |                                   |                  |   |                  |                                   |                  |
| very low                                  | 3.18<br>(0.56-18.09)                    | 0.192            | 1.88<br>(0.60-5.86)               | 0.279            | 2.21<br>(0.27-17.82)                    | 0.457            | 1.94<br>(0.53-7.12)               | 0.318            |
| low                                       | 0.80<br>(0.27-2.32)                     | 0.675            | 0.873<br>(0.43-1.79)              | 0.710            | 0.33<br>(0.09-1.31)                     | 0.115            | 0.99<br>(0.45-2.18)               | 0.969            |
| average                                   | 0.80<br>(0.38-1.65)                     | 0.537            | 1.31<br>(0.76-2.24)               | 0.332            | <b>0.42</b><br>(0.18-0.98)              | <b>0.045</b>     | 1.37<br>(0.76-2.47)               | 0.290            |
| good                                      | 0.68<br>(0.33-1.40)                     | 0.294            | 1.30<br>(0.76-2.23)               | 0.345            | <b>0.41</b><br>(0.18-0.94)              | <b>0.035</b>     | 1.31<br>(0.73-2.33)               | 0.364            |
| very good                                 | ref.                                    |                  | ref.                              |                  | ref.                                    |                  | ref.                              |                  |
| <b>School performance</b>                 |   |                  |                                   |                  |   |                  |                                   |                  |
| poor                                      | <b>5.85</b><br>(3.24-10.60)             | <b>&lt;0.001</b> | <b>1.94</b><br>(1.18-3.19)        | <b>0.009</b>     | <b>4.44</b><br>(2.13-9.25)              | <b>&lt;0.001</b> | 1.46<br>(0.83-2.57)               | 0.196            |
| medium                                    | <b>2.38</b><br>(1.64-3.50)              | <b>&lt;0.001</b> | <b>1.29</b><br>(1.03-1.62)        | <b>0.027</b>     | <b>2.40</b><br>(1.53-3.76)              | <b>&lt;0.001</b> | <b>1.30</b><br>(1.01-1.68)        | <b>0.039</b>     |
| good                                      | ref.                                    |                  | ref.                              |                  | ref.                                    |                  | ref.                              |                  |
| <b>Smoking</b>                            |   |                  |                                   |                  |   |                  |                                   |                  |
| yes                                       | <b>5.66</b><br>(3.63-8.83)              | <b>&lt;0.001</b> | <b>3.60</b><br>(2.76-4.70)        | <b>&lt;0.001</b> | <b>3.74</b><br>(2.14-6.52)              | <b>&lt;0.001</b> | <b>3.09</b><br>(2.30-4.16)        | <b>&lt;0.001</b> |
| no  | ref.                                    |                  | ref.                              |                  | ref.                                    |                  | ref.                              |                  |
| <b>Drug consumption</b>                   |   |                  |                                   |                  |   |                  |                                   |                  |
| yes                                       | <b>4.62</b><br>(2.64-8.09)              | <b>&lt;0.001</b> | <b>2.34</b><br>(1.80-3.12)        | <b>&lt;0.001</b> | <b>2.23</b><br>(1.14-4.38)              | <b>0.019</b>     | <b>1.93</b><br>(1.42-2.64)        | <b>&lt;0.001</b> |
| no  | ref.                                    |                  | ref.                              |                  | ref.                                    |                  | ref.                              |                  |

Legend: OR - Odds Ratio, AOR - Adjusted Odds Ratio, CI - Confidence Interval

According to the results of multivariable logistic regression model with higher age, the odds of being a binge drinker was higher among secondary school students and lower among university students.

Among secondary school students both boys and girls were almost the same likelihood being binge drinkers. In contrast, at the university, boys had significantly higher odds of being a binge drinker compared to girls.

The educational level of the parents did not seem to be a strong influencing factor of BD as no consistent higher odds for being a binge drinker were seen with a change in parents' educational levels, neither among secondary school nor among university students.

The likelihood of being a binge drinker was significantly lower if the family's economic status was better (average or good) among secondary school students. For university students, no significant association was found between the economic status of the family and BD.

If the self-reported school performance was worse, the proportion of BD was significantly higher in both student groups. Students reporting worse school performance, i.e. medium or poor, had a significantly higher likelihood of being a binge drinker. This association was stronger among secondary school students.

Both secondary school students and university students using tobacco or illicit drugs were significantly more likely to binge drink compared to the ones who did not.

#### 4 DISCUSSION

In this study performed on 2449 secondary school and university students, nearly every third student (30.5%) was classified as a binge drinker. Our result is in line with the main statements of the WHO, according to which the prevalence of BD was 33.9% among young adults (20-24 years) in the European Region in 2016. University students had much higher BD rate than secondary school students, but within the group of university students (19-27 years) a higher age was a protective factor against BD, whereas secondary school students had a higher chance of becoming binge drinkers with ages. Probably after 18, young people started to realize the negative effects of heavy alcohol consumption and/or get some information about it during their studies. This result is supported by the study of Moure-Rodríguez et al. (24). They followed and measured the alcohol consumption of Spanish university students at the ages of 18, 20, 22, and 24, finding that the proportion of BD decreased significantly with age.

Regarding gender differences, we found that nearly two times more young males (37.2%) than females (19.0%) engaged in BD, whereas in the WHO European Region, the male/female ratio was higher among adolescents (3.1) in

2016 (1). We found that, among university students, boys were more affected by BD as they had more than twice the odds of being a binge drinker than girls. Our finding is consistent with a Croatian study and two Romanian studies, where university male students were more affected by alcohol consumption (25-27).

Interestingly, this gender difference in BD did not occur among secondary school students. There is an interesting tendency in the change of BD prevalence regarding gender difference. WHO data suggest that BD has been declining among young people since 2010. In Hungary these declines have been greater for young males than females (males: 68.7% vs. 64.9%; females: 30.4% vs. 26.4%), leading to a significant narrowing of differences in alcohol misuse between the genders (28).

In our study no strong and consistent relationship was seen between the parents' highest educational level and BD. Also in the literature, no clear pattern of association was found between parental educational level and alcohol-related problems of the children. According to a study (29) young people whose parents had a tertiary school education were more likely to report BD; these findings might show that alcohol is accepted culturally among well-educated people. In another report, however, alcohol problems among adolescents were negatively associated with maternal education (30). A possible explanation for the negative association could be that parental disapproval of alcohol use correlates with the parents' higher education (31).

Among secondary school students, the family's better economic status seems to be a protective factor against BD. In contrast, no clear association was found between the family's economic status and BD in the case of university students. In the literature, the influencing effect of SES on BD is also inconsistent. Steiner and colleagues found that if the family affluence is below average, the risk is the highest for BD (29). People with lower SES appear to be more vulnerable to tangible problems and consequences of alcohol drinking (32), which could be explained by the fact that they are less able to avoid adverse consequences of their behaviour due to the lack of resources. Poor people cannot choose a safe environment, and they do not have good access to high-quality health care services. Møller and colleagues have found that low socioeconomic position is associated with more alcohol-related harm in Danish high school students, which is in line with our result (33). In contrast, according to another study, the economic status of the family has been medium or high in case of most binge drinker adolescents in Western European countries (34), which may be related to the greater availability of alcohol. A Norwegian population-based study investigated the association between family income during childhood and self-reported substance use in adolescence, including potential alcohol-related

problems. The chronically poor group was more likely to report never having tried alcohol compared to all other groups moving into or out of poverty (35). More financial resources seem to be positively related to BD, probably due to more pocket money.

According to our results, smoking was the strongest factor associated with BD. Students who smoke had more than thrice the chance for being a BD. This finding is consistent with several studies (22, 36).

Students who ever used any illicit drugs had a higher likelihood of being a binge drinker in our study. Concomitant use of alcohol, tobacco, and illicit drugs is typical for people at a younger age, who want to maximize their pleasures. These positive associations with smoking and drugs have also been reported in other publications among Slovenian (37) and Croatian university students (38).

Results indicate that binge drinker students have a significantly higher risk of poor academic performance than non-binge drinker students. This association was stronger in the case of secondary school students. In adolescence and young adulthood, poor school achievement has consistently been shown to be related to higher levels of BD (39). The result of our research is similar to another study (40) indicating that there is a possible link between poor academic performance and high alcohol drinking among Romanian university students. Heavy drinking Romanian university students reported academic problems such as receiving lower grades because of drinking. Binge drinker university students missed classes after drinking, drank alcohol before a class, and had trouble with school administration because of drinking. Some evidence also suggests that excessive alcohol use at younger ages predicts academic underachievement (41). Students after heavy alcohol intake are more likely miss a class and spend less time on academic activities, contributing to lower marks and poor academic performance. Several studies have indicated that intermittent alcohol consumption may constitute a greater risk to neurocognitive functioning than regular alcohol consumption (42). This negative effect of excess alcohol drinking was stronger in secondary school students than university students, because the brains of students younger than 18 are more vulnerable to the toxic effects of alcohol compared to older students.

#### 4.1 Strengths and limitations

The main strength of the present paper is the large sample size.

Several limitations must be acknowledged. First, the present findings were obtained from two samples of young people in Hungary. Different levels of BD and different associations might be expected in other drinking cultures and among older populations. Secondly, because students self-reported on their alcohol drinking, they might not

have responded truthfully, either because they could not remember or because they wished to present themselves in a socially acceptable manner. Thus, due to the inaccurate reporting of alcohol consumption, this survey may tend to underestimate it. Thirdly, we could not determine cause-and-effect relationships due to the cross-sectional type of this study. Fourthly, parental educational levels can also influence the answers, further investigations are needed to clarify this effect. Fifthly, only health faculties took part in this study.

## 5 CONCLUSIONS

To prevent problematic alcohol consumption in adolescents and young adults, it is of high importance to inform parents about the protective effects of active parenting behaviour. Considering the large number of binge drinker secondary school and university students, we emphasize the need for prevention of alcohol drinking and other risky behaviours, such as smoking or illicit drug experimentation, among Hungarian students. Since BD is strongly associated with tobacco and illicit drug consumption, with reducing the alcohol use, we can also influence young people's engagement with tobacco and drug use.

Our findings reveal the need for public health and individual policies in Hungary, with the aim of reducing drinking and alcohol-related consequences. Prevention should focus on students who drink on campus and use cigarettes and illicit drugs concomitantly.

## CONFLICTS OF INTEREST

The authors declare that no conflicts of interest exist.

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## ETHICAL APPROVAL

Received from the Scientific and Research Ethics Committee (ETT-TUKEB) (approval reference number: 25031-5/2015/EKU) and for university students from The Regional and Institutional Human Medical Biological Research Ethics Committee of the Szent-Györgyi Albert Clinical Centre, University of Szeged (No. 3563). All participants over 18 years signed a written informed consent form, whereas the participation of younger students was supported by their parents' written consent; the anonymity of personal information was guaranteed during data analysis.

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