

Relationship between Alcohol Consumption and Academic Success of Medical Students in Minsk, Belarus

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Abstract: - This article presents findings on the relationship between alcohol use and academic success of medical students. 265 medical students (107 males and 158 females) from the Belarusian State Medical University, Minsk (Belarus) were administered questionnaire, containing the AUDIT, CAGE, MAST, including other alcohol related questions. For analysis of academic success, "Academic Performance" questionnaire was administered. The number of students who reported consumption of alcohol was 74 males and 142 females. Alcohol users had lower academic success, compared to the non-alcohol users. The reported quantity (from $r = -0.135$ to $r = -0.278$) and frequency (from $r = -0.139$ to $r = -0.201$) of alcohol use correlated significantly with the GPA in different semesters. Linear regression of the effect of reported alcohol doses on the academic success of the drinkers revealed that the relationship was always negative and significant and, ranged from -0.007 ($p = 0.038$) to -0.016 ($p = 0.0001$) GPA points per ml of pure ethanol. The linear regression equation dependence of GPA on per session dose of alcohol for all 265 students was modeled to be $\text{GPA} = 7.079 + (-0.007) \times X$, where X is the reported per session dose of ethanol (ml); $p = 0.019$ for the coefficient of regression (-0.007); $p < 0.001$ for the value 7.079. Alcohol use was associated with decrease in academic success of medical students. This is the first study to investigate the relationship between alcohol use and academic success of medical students.

Key-Words: - relationship, alcohol, academic success, medical students, Minsk

1 Introduction

High levels of alcohol-related problems among young adults remain a matter of concern in many

countries [1–3], including Belarus [4–6]. Alcohol abuse in the general Belarusian students' population is associated with a whole set of problems, which include antisocial behavior, injuries, poor academic performance [4–7].

While other alcohol related problems also pose serious concern, poor academic performance among students appears to be a critical issue in furthering college education or future endeavors since academic performance is a gateway to many essential life outcomes, influencing the career options that are available to a student [8–11]. In some educational institutions, expelling the students is the result of extremely low academic performance. In medical universities or colleges, grade point average (GPA) below a certain limit will result to the student not able to pursue certain discipline. In some cases, monthly stipend is striped from the student, especially when he or she studies on scholarship. For example, in Belarus, where majority of the students study on government-funded scholarship, a GPA below a certain limit possibly attracts removal from the list of scholarship students, or decrease in stipends [9]. Likewise, better academic performance attracts better stipends or recommendations by the university authority or faculty dean. In addition, excellent academic performance also attracts white-collar jobs after graduation [9]. It has been documented in many reports that poor academic performance among students who consume alcohol, compared to their abstaining counterparts is one of effects of alcohol use [1, 12–14]. Reduction of academic performance according to [1] is due to the fact that alcohol consumption reduces the preparation time for classes. Such an effect could be significant, especially for freshmen [1]. However, in a previous study, conducted among freshmen, no significant difference in academic performance was observed between the results of alcohol users and non-alcohol users during the 1.5 years of university education [14]. This was probably due to the fact that a small proportion of the students started to use alcohol only after entrance into the university. However, Singleton suggested that negative impact of alcohol on the academic performance of freshmen indicated that they had started to drink alcohol during their studies at the primary school [1]. Numerous studies show that a large part of primary school students consumed alcohol even in large doses. Screening study conducted by [15], in which 90,118 primary school students participated, showed that 87% of boys and 90% of girls drank alcohol. Consequently, a 10% reduction in the GPA of students who

consume alcohol was observed. Other researchers obtained similar results [1].

In the last decade, emerging evidences have indicated an increase in the level of alcohol consumption among students [3–7], including medical students [6,7]. Increase in alcohol use by medical students could pose an enormous problem for their success in school-work. Results of our previous survey indicated an increase in the level of alcohol-related problems among students during the period of study in the university [7]. This phenomenon is caused by various factors, one of which may be a high level of stress experienced by students in the learning process [6]. Analysis of the results of screening studies has shown that majority of Belarusian students occasionally (1–4 times per month) consume alcohol [6,7,12]. Intoxication-oriented style of drinking (more than 5 standard drinks for men and 4 for women) is characterized for most of the alcohol users in the general Belarusian student population [7,12]. As a result, the risk of problems associated with alcohol use (including poor academic performance) increases among students even with a relatively moderate monthly dose of alcohol [12]. But, whether a relationship between indices of alcohol consumption and academic performance exist among medical students remain an open question.

The negative effects of alcohol use on academic performance among students in non-medical settings are somewhat understood [1,13–17]. However, no relationship between alcohol consumption and academic performance had been reported for medical students. The issue of the extent to which alcohol consumption might influence students' performance in the general Belarusian students' population has not been specially addressed. Among medical students in Belarus, whether differences in academic success exist among students who consume alcohol and those who totally abstain are not entirely understood. The dearth of data on the level of academic performance among medical students with different attitudes to alcohol use remains a matter of concern. Besides, data on the relationship between alcohol use and academic performance among medical students to some extent will help in the anti-alcohol campaign among the general medical students population.

The aim of this study was to investigate the relationship between alcohol consumption and academic performance in a sample of medical students in Minsk, Belarus.

2 Materials and Methods

2.1 Study Population

The screening was conducted in 2010/2011 academic year among the 3rd–6th year students of the Belarusian State Medical University (BSMU), Minsk, Belarus. Students who study in Belarusian universities (including the Belarusian State Medical University) had passed a state extermination to obtain the appropriate points before they were admitted. Majority of the students are those who had just completed their high school (usually 12 years of study). Generally, freshmen are within the age range 18–19 years. However, a few students (graduates from biological sciences disciplines) who wish to study medicine are admitted into the first year after they had passed the state extermination. As with other former soviet countries, in Belarus total number of years for completion of university studies in medicine is 6 years.

2.2 Sampling Size and Technique

Seniors (3rd–6th year students) of the BSMU volunteered for the study. 379 students were randomly invited to participate, 95 did not show up on various pretexts. Of the 284 participants who took part in the study, 19 students did not score appropriate points on a "sincerity test", so their questionnaires were excluded from processing. For statistical analysis, the data of 265 student-volunteers (107 males and 158 females), who scored on the sincerity test $\geq 60\%$ were included. Of the 265 students who agreed to participate, 160 students successfully completed the correction probe test for analysis of attention. The average age of students was 22 years (19–30 years). The final response rate in this study was 69.9%.

2.2.1 Criteria for Inclusion in the Study

- i. The result of "sincerity test" not less than 6 points out of 10 (60–100%).
- ii. Students who had passed annual medical examination, and never had disorders of hearing or other health problems that could limit their involvement in the proposed study.

2.2.2 Criteria for Exclusion from the Study

- i. Unwillingness to participate.
- ii. A "sincerity test" result ranging from 0–5 out of 10 (10–50%).

2.3 Procedure

The Ethics and Research Committee of the university approved the study protocol. Approximately 2–4 weeks before the study, students of the BSMU were invited by one of the authors (MOW) to participate. On the days (weekends) of the study, students present at the hostels were reminded 2–4 hours before the start of the study. Only those who volunteered and came were considered. General informed consent was verbally obtained from the students after the aims and objectives of the study had been explained. The study was anonymous. A paper-and-pencil based method of filling questionnaires was utilized. Participants were administered questionnaires: "General", the Alcohol Use Disorders Identification Test (AUDIT), MAST (Michigan Alcohol Screening Test), and CAGE (the Cut, Annoyed, Guilty and Eye questionnaire) [6,7,12], and "Academic Performance" questionnaire [12,14], and other questions. All questionnaires and tests used in this study are recommended for use in Belarus or had been previously used [6,7,12,14]. Questionnaires were distributed evenly in the 7 hostels of the BSMU. For efficiency, the study was conducted in phases. In each phase, 5–15 students participated.

2.4 Assessment of the General Characteristics and Level of Alcohol Use and Related Problems.

General characteristics of the respondents were assessed on the questionnaire "General" with built-in "sincerity test". The questionnaire "General" was meant to acquire general information about the participants (except name, surname). The level of alcohol use and related problems was determined with recommended screening tools – AUDIT, CAGE, MAST [6,7]. Assessment method of the results of CAGE and MAST was conducted as reported [7]. Measures used to assess drinking rate, quantity of alcohol use, and alcohol-related problems were based on the AUDIT, and had been previously reported [7]. The AUDIT is a validated and superior screening instrument and corresponds with the DSM-IV and ICD-10 definition of alcohol dependence and abuse. The AUDIT is a structured interview of 10 questions with a sensitivity of 92% and specificity of 93%. It correlates with both the MAST and the CAGE. The AUDIT gives a more accurate result in comparison with the CAGE and the MAST. A total score of ≥ 8 defines the presence of alcohol-related problems and a necessary referral to a specialist. Monthly doses of alcohol were

calculated based on the AUDIT number 1 and 2 questions. Per session dose was calculated as average of the stated amount (based on question number 2 of the AUDIT). The stated frequency of alcohol use (based on question number 1 of the AUDIT) was converted to monthly frequency and subsequently multiplied by per session dose to give the monthly dose. Loss of control over drinking was determined as any positive score on the number 4 question of the AUDIT. Hangover was based on the number 6 question of the AUDIT, whereas alcohol-related injury was based on the number 9 question [6,7,14].

2.5 Measures Used to Produce the Preference for Alcoholic Beverages

Regarding preferences for alcoholic beverages and duration of alcohol use, the following questions were formed and included at the bottom of the screening tests: Preference for alcoholic beverages? (Options: beer; wine; vodka) [7].

2.6 Determination of Academic Performance

All participants entered their examination scores (including resit examination scores) from examination cards for all periods of study at BSMU into the “Academic Performance” questionnaire. The filling of examination scores was controlled by one of the authors (MOW). Two indicators were calculated: Grade Point Average (GPA) of examination results for the 1st–9th semesters (2 semesters = one academic year); effectiveness to sit for examinations for the 1st time – 100%, 2nd time – 50% and 3rd time – 25%. Academic performance of students in Belarusian institutions is determined on the 10-point scale. A minimum score in examination carries a total of 1 point. A maximum score is 10. A score of 1, 2, and 3 is considered unsatisfactory with a necessity of resit examination for that given subject/course [12,14].

2.6 Data Analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences 16.0 version for Windows, the criteria of Pearson χ^2 , and Student’s t-test [21]. Results are presented as percentages (%), means and standard error of the means ($M \pm m$). Binging was defined as 5 and more standard drinks for males and 4 or more drinks for the females within a period of two hours. A scatter

plot was used to determine the most appropriate correlation analysis for the specific group of data (Pearson r , and Spearman ρ were used to determine the relationship between alcohol use and academic success). Equation for the linear regression line is of the form $Y \text{ (GPA)} = a + bX$, where Y (dependent) and X (independent, reported alcohol dose) are the variables; “ b ” is the slope of the regression line, and “ a ” is the intercept point of the regression line on the y axis. A significance level of $p < 0.05$ was considered reliable.

3 Results

Percentages of students who consume alcoholic beverages were 69.2% (74 of 107) among males and 89.9% (142 of 158) among females (Table 1). Thus, percentage of female alcohol users was 20.7% higher, compared to their male counterparts ($\chi^2 = 18.2, p < 0.001$). Of the total respondents, 45 (30 males and 15 females) were problem drinkers (Table 1). Percentages of male problem drinkers were significantly higher on all three tests “AUDIT” ($\chi^2 = 15.6, p < 0.001$), “CAGE” ($\chi^2 = 17.0, p < 0.001$), “MAST” ($\chi^2 = 11.8, p < 0.001$) compared with the data of the females. Majority (84.7%) of drinkers (both males and females) rarely, episodically consumed alcohol.

From the results presented in table 2, frequency and reported dose (per session and monthly doses) of alcohol are significantly higher among the problem drinkers, compared to the non-problem drinkers. The males reported higher doses of alcohol, compared to the females (Table 2).

TABLE 1. Average scores on the screening tests, percentage of non-drinkers, drinkers and the problem drinkers

Gender	Age in years (M±m)	Average score on the tests, M±m			Drinkers, %	Non-drinkers, %	Problem drinkers, %		
		AUDIT	CAGE	MAST			AUDIT	CAGE	MAST
M	Np, n=44	22.7±0.4	4.1±0.3*	0.8±0.3*	69.2 (n=74)	30.8 (n=33)	28.0 n=30	27.1 n=29	15.9 n=17
	P, n=30	22.4±0.3	14.2±1.4*	2.7±0.1*					
	All, n=74	22.6±0.3	8.2±0.8	1.4±0.2					
F	Np, n=127	22.0±0.1	2.7±0.1* [☼]	0.2±0.1* [☼]	89.9 [☼] (n=142)	10.1 [☼] (n=16)	9.5 [☼] n=15	8.2 [☼] n=13	3.8 [☼] n=6
	P, n=15	21.9±0.2	10.4±0.8* [☼]	2.3±0.2*					
	All, n=142	22.0±0.1	3.5±0.3 [☼]	0.4±0.1 [☼]					

Note: n – number of respondents in each group. M – males. F – females. Np – non-problem drinkers. P – problem drinkers. All – all alcohol users. [☼] $p < 0.05$ – in relation to analogical parameters of the males of the corresponding group (Np, P, All). * $p < 0.01$ – differences are significant between corresponding values of students (M, F) in groups Np and P.

TABLE 2. Reported frequency and dose of alcohol by the medical students with different attitudes to alcohol use

Gender		Body mass, kg	Frequency and dose of reported alcohol use, M±m		
			Frequency	ml/1 session	ml/month
M n=74	Np, n=44	72.2±1.9	2.4±0.5*	48.8±3.1*	117±21*
	P, n=30	69.8±2.4	6.2±0.9	80.6±5.8	500±91
F n=142	Np, n=127	56.6±0.6 [☼]	1.9±0.1*	27.4±1.1* [☼]	52±4 [☼]
	P, n=15	54.9±1.6 [☼]	4.7±0.9 [☼]	50.7±6.1	238±58 [☼]

Note: designations are the same as in Table № 1. Alcohol doses are given in values of absolute ethanol.

The higher level of alcohol consumption by the problem drinkers (especially the males) was reflected on the reported rate of alcohol related problems (Table 3). Percentage of alcohol related problems among the problem drinkers (both genders) significantly exceeded the level of reported problems by the non-problem drinkers (2.9–17.6 times higher among the problem males and 2.8–16.9 times higher among the problem females, compared to the non-problem drinkers of corresponding genders). Bingeing was reported in all female problem drinkers (100%), which exceeded analogical value in the male problem drinkers by 26.7% ($P < 0.05$; $\chi^2 = 4.865$) and 48.4% ($P < 0.001$; $\chi^2 = 13.375$) among the female non-problem drinkers.

Consumption of weak (beer) and medium strength (wine) alcoholic beverages was reported by majority of the female (non-problem and problem drinkers) and male non-problem drinkers. In addition to the use of weak strength alcoholic beverages, male problem drinkers also reported high consumption rate of strong strength alcoholic beverages (vodka) (table not shown).

TABLE 3. Percentages of different alcohol related problems among the medical students with different attitudes to alcohol use

Gender		Binging, %	Loss of control, %	Hang-over, %	Guilt, %	Blackout, %	Injuries, %	Fight, %	#Problems with relations, %
M	Np, n=44	59.1	6.8*	13.6*	27.3*	9.1*	6.8*	9.1*	2.27*
	Pr, n=30	73.3	46.7	40.0	83.3	53.3	70.0	33.3	40.0
	All, n=74	64.9	23.0	24.3	50.0	27.0	32.4	18.9	17.6
F	Np, n=127	50.4*	3.1*	3.1* [⊙]	18.9*	11.0*	4.7*	4.7	4.7*
	Pr, n=15	100 [⊙]	20.0 [⊙]	46.7	80.0	66.7	46.7 [⊙]	13.3	33.3
	All, n=142	55.6	4.9 [⊙]	7.8 [⊙]	25.4 [⊙]	16.9 [⊙]	9.2 [⊙]	5.6 [⊙]	7.8 [⊙]

Note: designations are the same as in Table 1. [⊙] $p < 0.05$ – in relation to analogical parameters of the males of the corresponding group. * $p < 0.005$ – differences are significant between corresponding values of students (M, F) in groups Np and P. Statistical value for significance was calculated on χ^2 -Pearson. # – problems with relations due to alcohol use.

Figure 1 shows that non-drinkers of both genders had significantly higher GPA, compared to the drinkers. A detailed analysis of academic performance revealed that GPA of moderate/non-problem drinkers and problem drinkers was significantly lower on the 2nd–9th semesters, compared to the non-drinkers. There was a significant decrease in GPA of problem drinkers (males and females) by 0.9–2.2 points (Figure 1) on the 1st–9th semesters, compared to the values for non-drinkers. Similar differences were found between the GPA of problem and moderate drinkers, precisely, in the females' group during the 1st–6th and 9th semesters and in the males' group during the 4th semester. The GPA of non-problem drinkers based on the results of these semesters was 0.6–1.5 points higher, compared to the problem drinkers. Pronounced gender-specific differences in GPA were also observed for non-drinkers on the 1st, 4th, 6th, and 7th semesters; drinkers on the 1st–5th semesters (including non-problem drinkers on the 1st–4th semesters). Generally, females had better academic performance than the males. At the same time, disappearance of differences in GPA between

female and male alcohol users was noted after 2.5 years of university education. The GPA of male and female problem drinkers did not differ in any of the semester examinations (Figure 1).

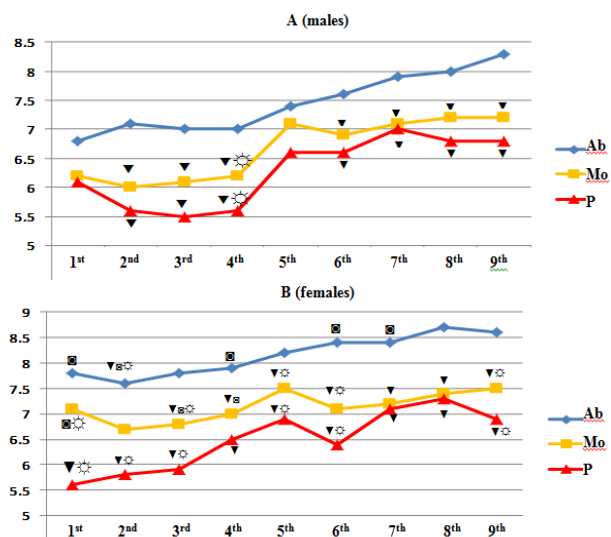


Figure 1: Semester (1st–9th) GPA of medical students with different attitudes to alcohol use. Note: Abbreviations are the same as in table 1. F (n=158) – females; M (n=107) – males; M + F (n=265) – all students that participated in the study. Ab – abstainers/non-alcohol users (M – n=33, F – n=16); Mo – moderate alcohol users/non-problem drinkers were those who did not qualify as problem drinkers on the AUDIT (M – n=44, F – n=127); P – problem drinkers (M – n=30, F – n=15). Significance between different groups was obtained based on

the Student's t-test and the Pearson χ^2 criterion. ▼ $p < 0.02$ – in relation to corresponding parameters of the abstainers (males and females); ☆ $p < 0.05$ – between parameters of the problem drinkers (P) and moderate alcohol users (Mo); ■ – in relation to corresponding parameters of the males in the same group (Ab, Mo or P).

Analysis of effectiveness to sit for examinations among the non-drinkers and drinkers showed a similar pattern as in GPA dynamics. Drinkers were more involved in resit examinations: males on the 1st, 3rd, 4th, and 6th semesters; females on the 1st, 2nd, 5th–9th semesters (figure not shown).

The weak, but significant negative correlation between the reported quantity (from $r = -0.135$ to $r = -0.278$) and frequency (from $r = -0.139$ to $r = -0.201$) of alcohol use by students and their GPA starting on the 1st–7th semesters was identified (Table 4). The calculated proportion of direct negative impact of alcohol on the GPA in the drinkers was 1.82% ($p = 0.040$)–7.73% ($p < 0.001$). Among the females, the relationship ranged from -0.159 to -0.300 in different semesters and was observed in 81% of the analyzed pairs (Table 4). Rank correlation among the males showed the presence of numerous significant relationships between quantity, frequency of alcohol use and the GPA (Table 4).

Analysis of linear regression of the effect of reported alcohol doses on academic success (on the 1–9th) of the drinkers revealed that the relationship was always negative and significant and, ranged

from -0.007 ($p = 0.038$) to -0.016 ($p = 0.0001$) GPA points per ml of pure ethanol. The formula of linear regression dependence of GPA on per session dose of alcohol (calculated on the average GPA of all 265 students on 1st–9th semesters) is $\text{GPA} = 7.079 + (-0.007) \times X$, where X – reported per session dose of ethanol (ml); $p = 0.019$ for the coefficient of regression (-0.007); $p < 0.001$ for the value 7.079. Thus, the regression analysis shows the negative impact of alcohol on academic performance and allows predicting the amount of reduction in GPA. Among the females, the formula of linear regression dependence of GPA on per session dose of alcohol (calculated from the results of 158 students of 1st–9th semesters) is: $\text{GPA} = 7.615 + (-0.016) \times X$, where $p = 0.001$ for regression coefficient (-0.016); $p < 0.001$ for the value 7.615. Among the males, the coefficient of regression was 6 times less than in females and was not statistically significant (table not shown).

The linear regression dependence of GPA (calculated on the results of the exams from the 1st to the 9th semesters of all 265 students) on the AUDIT score was determined as: $\text{GPA} = 7.133 + (-0.065) \times B$, where B – AUDIT test score; $p < 0.001$ for the regression coefficient (-0.065); $p < 0.001$ for the value 7.133. For the females, this regression coefficient was -0.086 ($p = 0.002$). However, for the males, no statistical significance was found for the regression coefficient (table not shown).

TABLE 4. Correlation between parameters of reported alcohol consumption by the medical students and the average examination scores (GPA)

Parameters of reported alcohol use	Correlation values between alcohol use and GPA, with the corresponding <i>p</i> -values						
	1 st semester	2 nd semester	3 rd semester	4 th semester	5 th semester	6 th semester	7 th semester
Pearson linear correlation, <i>r</i> (265 students)							
ml/ per session	-0.146* <i>p</i> = 0.017	-0.278* <i>p</i> = 0.000	-0.191* <i>p</i> = 0.002	-0.161* <i>p</i> = 0.009	-0.135* <i>p</i> = 0.040	-0.232* <i>p</i> = 0.000	-0.139* <i>p</i> = 0.038
frequency/ month	-0.113 <i>p</i> = 0.067	-0.170* <i>p</i> = 0.006	-0.152* <i>p</i> = 0.013	-0.148* <i>p</i> = 0.016	-0.154* <i>p</i> = 0.019	-0.201* <i>p</i> = 0.002	-0.139* <i>p</i> = 0.038
ml/month	-0.142* <i>p</i> = 0.021	-0.201* <i>p</i> = 0.001	-0.142* <i>p</i> = 0.021	-0.148* <i>p</i> = 0.016	-0.160* <i>p</i> = 0.015	-0.181* <i>p</i> = 0.006	-0.072 <i>p</i> = 0.290
Pearson linear correlation, <i>r</i> (158 females)							
ml/ per session	-0.272* <i>p</i> = 0.001	-0.220* <i>p</i> = 0.005	-0.246* <i>p</i> = 0.002	-0.181* <i>p</i> = 0.023	-0.174* <i>p</i> = 0.029	-0.213* <i>p</i> = 0.008	-0.161* <i>p</i> = 0.047
frequency/ month	-0.209* <i>p</i> = 0.008	-0.159* <i>p</i> = 0.047	-0.187* <i>p</i> = 0.019	-0.144 <i>p</i> = 0.072	-0.124 <i>p</i> = 0.121	-0.244* <i>p</i> = 0.002	-0.097 <i>p</i> = 0.234
ml/month	-0.300* <i>p</i> = 0.000	-0.201* <i>p</i> = 0.011	-0.252* <i>p</i> = 0.001	-0.195* <i>p</i> = 0.014	-0.210* <i>p</i> = 0.008	-0.246* <i>p</i> = 0.002	-0.117 <i>p</i> = 0.150
Spearman rank correlation, ρ (107 males)							
ml/per session	-0.067 <i>p</i> = 0.496	-0.366* <i>p</i> = 0.000	-0.224* <i>p</i> = 0.020	-0.184 <i>p</i> = 0.057	-0.078 <i>p</i> = 0.507	-0.311* <i>p</i> = 0.008	-0.200 <i>p</i> = 0.099
frequency/ month	-0.066 <i>p</i> = 0.503	-0.271* <i>p</i> = 0.005	-0.231* <i>p</i> = 0.017	-0.260* <i>p</i> = 0.007	-0.069 <i>p</i> = 0.559	-0.293* <i>p</i> = 0.013	-0.243* <i>p</i> = 0.046
ml/month	-0.063 <i>p</i> = 0.520	-0.310* <i>p</i> = 0.001	-0.222* <i>p</i> = 0.022	-0.224* <i>p</i> = 0.020	-0.095 <i>p</i> = 0.420	-0.319* <i>p</i> = 0.006	-0.236 <i>p</i> = 0.051

Note: The use of Pearson linear (*r*) or Spearman rank correlations (ρ) was determined on a scatter diagram. * *p* – correlation values are significant. Correlation values were calculated for 1–7th semesters since the participants' academic performance for the 8th and 9th semesters was few and did not show significant values.

4 Discussion and Conclusion

The findings of this study indicate the presence of significant differences in academic performance among students who consume alcoholic beverages and those students who totally abstain in the general medical students' population in Minsk, Belarus. The relationship between alcohol consumption and academic performance was observed in this study.

The higher prevalence of alcohol use among the females confirms recent trends about the wider prevalence of alcohol use by the female gender, compared to the males [3,4]. The higher, but similar percentages on the AUDIT and CAGE had been reported in a previous study [7]. This may suggest a higher sensitivity of the AUDIT and CAGE (in relation to the MAST) for the detection

of alcohol related problems among the young population of Slavs.

The lower academic performance of drinkers was due to increase in the number of resit examinations, which started to increase even at occasional (1–4 times per month) alcohol use. The weak, but statistically significant negative correlation between the reported quantity (from $r = -0.135$ to -0.278) and frequency (from $r = -0.139$ to -0.201) of alcohol use by students and their GPA confirms previous findings [1,13]. Analogic results were reported by other authors in a sample of non-medical students. For example, [1] reported a weak ($r = -0.26$), but significant relationship between the level of alcohol use and GPA of students.¹ There were gender-specific differences in the value of GPA

of males and females. The higher academic performance level among the females, compared to the males may point to a more conscientious attitude of the females to learning, establishing for themselves a higher standard, which is a source of psychological stress. This could result in disruption of adaptive processes [2]. The disruption of adaptive processes could lead to development of negative effect of alcohol use even at low-to-moderate doses. The findings of this study suggest that the effects of ethanol are more pronounced for the females, compared to the males. Evidence of this fact, is emphasized on the significantly lower (by 2–4 times) rate of alcohol consumption by the females, compared to the males (Table 2) and a greater frequency of statistically reliable relationships between the consumption of ethanol and GPA among the female students (81%), compared to the male students (57%).

Earlier, it was suggested that the lower examination results among drinkers might indicate on one hand, the negative impact of drinking, and on the other hand, poor academic performance could be a trigger factor for early alcohol use by individual learners [14]. In addition, it is possible that drinking is associated with an unscrupulous attitude to learning. However, the regression analysis in this present study showed that alcohol consumption was the cause of decrease in academic performance. This cause-effect (regression) model showed that in the general medical students' population, for every ml increase in alcohol consumption, the academic performance decreases by a coefficient of 0.007 ($p = 0.019$). The regression coefficients among the females indicate a more negative impact of alcohol use on their academic performance, compared to the general population of medical students. This point to the higher negative impact of alcohol consumption, even at low-to-moderate doses among the females, compared to the males. Although, among the males, rank correlation analysis revealed the presence of relationship between the quantities, frequency of alcohol consumption and GPA, the regression analysis did not reveal any statistically significant value. Notwithstanding, however, it is also possible that academic performance decrease could be caused by other factors. Studies have shown that the

majority of medical students suffer from high levels of stress, which is associated with a variety of problems, including anxiety, depression, "burnout", lower academic performance, alcohol and drug abuse [2,22–25]. It was found that the stress levels negatively correlated with the academic success of students [25]. According to results of a screening study, the main source of stress in students is the large academic load [2].

The results of this study point to the urgent need to consider the review of the definition of non-problem drinking on the AUDIT. The results clearly indicate the substantial harm of drinking even at low-to-moderate amounts on the academic performance (which is an index of cognitive functions), compared to the non-drinking medical students.

It is true that study in medical college is quite a difficult one and requires constant mental activities. That is probably why, in spite of the good GPA, resit examinations were recorded even among the non-drinking medical students. The higher number of resit examinations among non-problem drinkers, compared to the non-drinking medical students, indicates the absence of a safe dose of ethanol for young adults. Hence, alcohol use, even in moderate doses, whether in the form of weak strength (e.g. beer), medium strength (e.g. wine) or strong strength (e.g. vodka) beverages, is unsafe as it is associated with decrease in academic success.

These facts confirm existing notion that alcohol use is a risk factor for decrease in academic success [1,14]. This gives reason to believe that a single and relatively safe occasional dose or a monthly dose of alcohol for students practically does not exist.

These facts confirm existing notion that alcohol use is a risk factor for decrease in academic success [1,14]. This gives reason to believe that a single and relatively safe occasional dose or a monthly dose of alcohol for students practically does not exist.

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