Cognitive functions and neuropsychological status of medical students with different attitudes to alcohol use: A study conducted at the Belarusian State Medical University, Minsk, Belarus

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HIGHLIGHTS

- Alcohol users had lower cognitive and academic performances, poor neuropsychological states, compared with non-alcohol users.
- Majority of the medical students, regardless of their attitude to alcohol, had moderate state anxiety levels.
- Subjective assessment of the functional state by the participants was in agreement with the objective measures of cognitive performance.
- An inverse dose-dependent relationship exists between alcohol consumption, and cognitive functions, academic performance and neuropsychological status.

ARTICLE INFO

ABSTRACT

This article presents findings on the effects of alcohol use on cognitive performance, functional (well-being, activity, mood) and neuropsychological status and anxiety levels of medical students. A total of 265 medical students (107 males and 158 females) from the Belarusian State Medical University, Minsk (Belarus) were administered questionnaire, containing the AUDIT, CAGE, MAST, and PAS, and other alcohol related questions. Academic Performance questionnaire was administered together with other tests. For analysis of cognitive functions, a "correction probe" test was used. The number of students who reported consumption of alcohol was 74 males and 142 females. Medical students who reported alcohol consumption had lower cognitive performance and academic success, poor self-assessment of their functional and neuropsychological states, compared to the non-alcohol users. The results of this study suggest an inverse dose-dependent relationship between alcohol consumption, and cognitive functions, academic performance and neuropsychological status of medical students.

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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, and poor academic performance [4–7]. 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 [2,6,7]. Analysis of the results screening studies has shown that the majority

of Belarusian students episodically, occasionally consume alcohol [4,5,7,8]. 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 [6,8]. As a result, the risk of problems associated with alcohol use, precisely a decrease academic performance increases among students even with a relatively moderate monthly dose of alcohol [8]. Since the number of students who occasionally consume alcohol in moderate doses is far higher than the problem drinkers (in relation to the general population), the percentage of alcohol related problems becomes higher among the moderate drinkers, compared to the problem drinkers. This phenomenon has been termed the "preventive paradox" [9,10]. Research suggests that prevention paradox might be especially pronounced among young adults, mostly for acute cases of alcohol involvement.

Alcohol has a strong neurotoxic effect on the developing and developed brain, leading to cognitive impairment, especially in young adults [3,6,8]. The term "cognitive function" is often used to refer to such higher integrative brain functions such as memory, attention, thinking

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and executive functions [6,8,11,12]. Disorders of higher integrative brain functions under the influence of acute and chronic alcohol abuse are associated with direct or indirect neurotoxic effects [6,8,11,12]. Reduced function of the frontal brain in young adults during problem solving had been reported [13,14]. Alcohol-related memory decline is associated with hippocampal dysfunction, which occurs frequently in alcohol abusers [13,15]. This may be related to the poor academic performance of students who consume alcohol [8,16]. Reduction in academic performance could have other mechanisms, including cognitive decline due to rising levels of erroneous actions [16]. Correlation between neuronal activity in the anterior cingulate cortex and the number of errors committed in an experiment with the academic performance of students is reported [16].

In episodic use of small–moderate doses of alcohol, impairment of higher integrative brain functions may not be noticeable, but in particular conditions (e.g. during complex task execution requiring high cognitive control), the effect of alcohol may manifest [8]. Cognitive functions are required for the functioning of other types of higher integrative brain functions. The impairment of cognitive functions and information processing leads to increase in erroneous actions — are some of the effects associated with alcohol consumption [8,16]. Disorders of cognitive functions caused by alcohol, not only lead to a decrease in academic performance, but may affect the ability of students to adapt in a changing environment [8,16].

The issue of the extent to which alcohol consumption might influence students' performance (both academic and cognitive) in the general Belarusian students' population has not been specially addressed. There is a dearth of data on the neuropsychological status of students who consume alcohol, compared to those who totally abstain. While the effects of acute and chronic alcohol intoxication on the state of cognitive functions are fairly well understood, the impact of alcohol on the cognitive functions of young students during a week or few after drinking moderate amounts of alcohol is not fully understood [8]. In the general Belarusian students' population, the ideas on whether differences in academic success, cognitive performance and neuropsychological status exist among students who consume alcohol and those who abstain is not fully understood. It can be assumed that cognitive impairment, which is noted in alcohol intoxication, is also retained in the period of abstinence. In this regard, it is necessary to investigate the long-term effects of alcohol on the cognitive functions of students, who consume alcohol, and how they are linked to the neuropsychological status of the students (well-being, activity, mood, neuropsychological adaptation, and their anxiety level).

The aim of this study was to investigate the differences in cognitive functions, academic performance, and neuropsychological status of students who consume alcoholic beverages in the general medical students' population in Minsk, Belarus.

2. Materials and methods

2.1. Study population

The screening was conducted in the 2010/2011 academic year among the 3rd–6th year students of the Belarusian State Medical University (BSMU), Minsk, Belarus.

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, and 95 did not show up on various pretexts. Of the 284 participants who took part in the study, 19 students did not score the appropriate point in 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 ≥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 the 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
1. The result of the "sincerity test" not less than 6 points out of 10 (60–100%).
2. Students who had passed annual medical examination, and never had disorders of hearing and vision that could limit their involvement or performance in the proposed study.

2.2.2. Criteria for exclusion from the study
1. Unwillingness to participate.
2. A "sincerity test" result ranging from 0 to 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. They were also told to abstain totally from alcohol consumption in any composition, 1–2 weeks before the study. On the days (weekends) of the study, students present at the hostels were reminded 2–4 h 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), CAGE (the Cut, Annoyed, Guilty and Eye-opener questionnaire) [6,7], PAS test (Post-alcohol intoxication) [23] and "Academic Performance" questionnaire [8], and other questionnaires to determine the functional and neuropsychological status of the participants — WAM (Wellbeing, Activity, Mood) [17–19], NPA (Neuropsychological adaptation) [20,21], and anxiety levels [22]. All questionnaires and tests used in this study are recommended for use in Belarus [6,7,23]. Questionnaires were distributed evenly in the 7 hostels of the BSMU. This initial phase took 1 h and 30 min. Thereafter, for 5 min, participants completed a correction probe test for analysis of cognitive performance. 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 the recommended screening tools — AUDIT, CAGE, MAST [6,7] and PAS [23]. Measures used to assess drinking rate, quantity of alcohol use, and alcohol-related problems were based on the AUDIT [7]. The dose and frequency of alcohol use were determined on the AUDIT. Monthly doses of alcohol were calculated based on the AUDIT number 1 and 2 questions. The dose per occasion was calculated as average of the stated amount (based on question number 2 of the AUDIT). The stated frequency of alcohol use (based on the AUDIT number 1 question) was converted to monthly frequency and subsequently multiplied by dose per occasion to give the monthly dose. The alcohol doses were rather calculated as monthly doses for the sake of uniformity in data reporting. Also, some respondents rarely (one time in 2 weeks) use alcohol. Loss of (impaired) control over drinking was determined as any positive score on the number 4 question of the AUDIT [7]. Hangover was determined on the number 6 question of the AUDIT, whereas alcohol-related injuries were determined on the number 9 question of the AUDIT [7].