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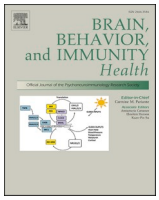

How does psychoactive substance use affect health students? An important local cutout

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ABSTRACT

Epidemiological data show that the use of alcohol and other psychoactive substances is higher among university students when compared with the general population and high school students. The use of psychotropic drugs by students in health courses requires special attention, taking into account that they will be responsible for the health education and care of the population. This study investigates the factors that determine current prevalence of psychoactive substances use among health students, analyses the impact of associated risks and assesses the significance of gender on substance use. A descriptive cross-sectional study was carried out from September 20, 2019 to June 15, 2021, in which students from Biological and Health Sciences at the Federal University of Bahia (UFBA) were the target population. 514 responses were obtained, of which 502 were considered to fulfil the inclusion criteria. The parameters included recreational use of psychoactive substances, both for lifetime use and for use in the last 3 months; the prevalence of alcohol, cannabis and tobacco was the highest in that order. Only alcohol, cannabis and inhalants showed a percentage of individuals at high risk of developing problems. These results indicate the need for local intervention, in order to prevent risky behaviour, damage to mental health and major consequences for society and academic performance.

1. Introduction

The consumption of psychoactive substances is not a recent phenomenon. Since prehistoric times, these substances have been present among different cultures. Throughout history, its use has not only been associated with medicine and science, but also with recreational use, culture, mysticism and religion (Seibel and Toscano, 2001).

According to the report released by the United Nations Office on Drugs and Crime (UNODC), there has been a concerning rise in global drug use, with users worldwide numbering 292 million in 2022, an increase of 20 % over the past decade. Cannabis still remains the most widely used illegal drug globally, with 228 million users. It is followed by opioids (60 million users), amphetamines (30 million users), cocaine (23 million users), and ecstasy (20 million users). The report also reveals that the emergence of new synthetic opioids and unprecedented supply and demand for other drugs have turned global emergency, leading to an increase in drug use disorders and environmental damage (United Nations Office on Drugs and Crime, 2024).

According to data from the 3rd National Survey on the Use of Drugs by the Brazilian Population, coordinated by the Oswaldo Cruz Foundation (Fiocruz), the most consumed illicit substance in Brazil is cannabis: 7.7 % of Brazilians aged between 12 and 65 have used it at least once in their lives. In second place is cocaine, which was consumed by 3.1 % of the population. Approximately 1.4 million people between 12 and 65 years old reported having used crack and similar drugs at some point in their lives, which corresponds to 0.9 % of the research population. As for licit substances, more than a half declared to have already consumed alcoholic drinks (Bastos et al., 2017).

Some epidemiological studies were carried out in Brazil aiming to investigate the prevalence of drug use among the university student population. Among several pieces of information, higher consumption of alcohol and other psychoactive substances was evidenced among college students when compared with the general population and high school students (Oliveira et al., 2009).

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Drugs such as anxiolytics, opioid analgesics and amphetamines are drugs widely accepted and used worldwide in modern medicine as important therapeutic resources. These drugs have also been used in an abusive manner and causing as much harm as illicit drugs (Sengik and Scortegagna, 2008).

The abusive use of these drugs can have major toxicological implications. Between 1986 and 2006, 1,220,987 cases of intoxication were registered in Brazil by the National System of Toxic-Pharmacological Information (SINITOX), with a total of 7597 deaths (0.6 %). Since 1994, medicines have taken the first position among the causes of intoxication between the toxic agents studied, corresponding to 24.5 % of the cases that were registered in the country (Mota et al., 2012).

One of the main reasons that may lead to the beginning of the use of a psychoactive substance is the feeling of pleasure, known as positive reinforcement. Therefore, individuals increasingly participate in recreational consumption of psychoactive substances (without therapeutic purposes) as an attempt to find relief from day-to-day problems or just as a spark of curiosity to try new experiences (Carvalho et al., 2011; Silva et al., 2014).

The main consequences of psychoactive substance consumption among Brazilian college students include: car accidents, violence, risky sexual behavior, decrease in academic performance, decreased perception, attention to detail and stress (Silva et al., 2006). Evidence of the immunosuppressive effects of drug use are further supported by epidemiologic studies demonstrating an increased rate of infections amongst persons with substance use disorder (SUD) (Blackard and Sherman, 2021).

University students from health courses deserve a special mention when it comes to the use of psychotropic drugs, as they will be responsible for the health education and care of the population in the future, as well as identifying and referring patients with problems related to the use of psychotropics and also because they serve as a model for their patients (Lucas et al., 2006). The use of psychoactive substances by academics from health courses is a concerning factor, as it causes damage to the physical and mental health of the student, and also impacts the society (Portugal et al., 2008).

The issue of substance use among health science students has not received adequate attention. Therefore, the necessity to conduct studies in this area becomes crucial, which the rationale has been mentioned previously in this document. This study investigates the factors that determine the current prevalence of psychoactive substances use among health students, analyses the impact of associated risks and assesses the significance of gender on substance use.

2. Materials and methods

2.1. Sampling and Selection

A descriptive cross-sectional study was carried out from September 20, 2019 to June 15, 2021, with students from Biological and Health Sciences at the Federal University of Bahia (UFBA) being the target population. UFBA offers 14 undergraduate courses in this area of knowledge, they are: Biological Sciences, Natural Sciences, Nutrition, Gastronomy, Pharmacy, Nursing, Biotechnology, Public Health, Animal Science, Veterinary Medicine, Medicine, Dentistry, Speech–Language Pathology and Physiotherapy.

This study was approved by the Research Ethics Committee of the Faculty of Pharmacy at UFBA (CEP-FACFAR/UFBA no. 3,158,711). For data collection, the following eligibility criteria for students were adopted: (i) be at least 18 years old, (ii) be enrolled in one of the Biological and Health Sciences undergraduate courses at UFBA, (iii) sign the Informed Consent Form and agree to participate in the research.

2.2. Data collection

For data collection, a standardized, anonymous completion questionnaire was used and applied online. The distribution of the research was conducted in the classroom and online, through the collaboration of professors from the Institute of Health Sciences (ICS) at UFBA and the Faculty of Pharmacy. The professors have participated only in the transmission of the questionnaires via sending emails. The e-mails of the students were requested in the classroom, on the virtual learning platform of UFBA (Moodle), and also all faculties were asked to send the link to the questionnaire.

The questionnaire was prepared based on questions from the WHO ASSIST (Alcohol, Smoking and Substance Involvement Screening Test), which is a test to identify problems related to the use of alcohol and other substances, through a score generated at the end of its application. ASSIST was validated in Brazil in 2004 and is intended for use in primary health care settings. Its psychometric properties identify the use of psychoactive substances and its associated problems in a first contact with the individual (Henrique et al., 2004).

According to the ASSIST score, the risk of developing problems related to substance use was classified, where individuals with scores up to 10 for alcohol and up to 3 for other drugs are considered low-risk users, which means that although they occasionally use these substances, they still do not have problems related to this use. Subjects with scores between 11 and 26 for alcohol and between 4 and 26 for other drugs may have harmful substance use and are at moderate risk of developing problems due to drug use. Persons with scores of 27 or more for any drug are at high risk of developing disorders due to consumption of the investigated substance.

In addition, questions from questionnaires used in other works on the subject were added, such as a study conducted among medical students in Salvador, Bahia (Lemos et al., 2007). The questionnaire of the Brazilian Center for Information on Psychotropic Drugs (CEBRID) of the VI National Survey on the Consumption of Psychotropic Drugs among Elementary and High School Students in the Public and Private Education Networks in the 27 Brazilian Capitals was also used as a reference. The main variables collected were related to the sociodemographic profile (sex, age, ethnicity, income), students' reports regarding academic life and consumption of psychoactive substances, in both lifetime use and consumption in the last 3 months of these substances.

Study data were collected and managed using REDCap electronic data capture tools hosted at CHU Clermont-Ferrand. REDCap (Research Electronic Data Capture) which is a secure web-based application designed to support data capture for research studies (Harris et al., 2009).

2.3. Statistical analysis

Sample size was determined to achieve an accuracy of the confidence interval of prevalence of psychoactive drugs use of ±5 %. According to data from the Superintendence of Academic Administration (SUPAC) at UFBA, about 7943 students of these courses were enrolled when we started the research. The sample size calculation was performed using the Epidat 3.0 program, considering a confidence level of 95 %, a margin of error of 5 % and an expected proportion of 50 % for the events studied, resulting in a sample size of 367 students.

Data were analyzed using the SPSS program (Statistical Package for the Social Sciences – Inc. Chicago, Illinois), version 20 for Windows. Descriptive measures are presented in tables with percentages, mean, median, minimum, maximum, and standard deviation. The value of "n" refers to the size of the evaluated sample.

Collected variables were compared between genders. The normality assumption was studied using the Shapiro-Wilk test. Quantitative data were compared between independent groups in order to verify a possible relationship, using the Mann-Whitney test. Comparisons between groups in relation to categorical data were performed using the Chi-square test. In cases where there were expected frequency values lower than five, Fisher's exact test was used.

All results were considered significant for a probability of

significance lower than 5 % ($p < 0.05$), with at least 95 % confidence in the conclusions presented.

3. Results

From 2253 contacted students, data were collected from 514 participants who completed the questionnaires. 12 responses were excluded because they did not meet the inclusion criteria (9 students were not enrolled in Biological and Health Sciences courses at UFBA and 3 respondents were under age), thus resulting in 502 validated responses. Most respondents were female (72.9 %), brown-skinned (39.2 %), with income between 1 and 3 minimum wages (46.8 %) and mean age of 25.2 years with a standard deviation of 7.7 years (Table 1).

Regarding the students' course, we had the highest numbers of responses in the Biological Sciences (15.5 %), Speech–Language Pathology (14.7 %) and Pharmacy (12.4 %) courses, but data were obtained from all courses of Biological and Health Sciences (Table 2).

For the use of psychoactive drugs with medical prescription, throughout their lives, 437 participants (87.1 %) reported that they had never used them. The 65 participants (12.9 %) who revealed that they had used them at some stage in their lives, often in association, of the following classes: antidepressants, sedatives/hypnotics, anticonvulsants, antipsychotics, medications for the treatment of Attention Deficit Hyperactivity Disorder (ADHD), mood stabilizers, and drugs for the treatment of mania episodes, as shown in Table 3.

This study revealed that for psychoactive substances used throughout life, at least once and recreationally/without prescription, alcohol was the most used substance (83.3 %), followed by cannabis (37.5 %) and tobacco products (32.5 %). The same pattern of frequency of use was repeated for recreational/non-prescription consumption in the last 3 months, with alcohol (72.9 %), followed by cannabis (19.9 %) and tobacco products (16.9 %) as the most consumed substances. However, changes were observed in the frequency of consumption for some of these substances (Table 4).

Consumption of psychoactive substances in the last 3 months was compared between males and females. Only tobacco and cannabis had statistically significant results ($p < 0.05$), with higher consumption by males for both substances (Table 5).

The average number of doses ingested when these students consumed alcoholic drinks was also compared between males and females. Gender has an effect on the number of doses of alcohol ingested, with males ingesting on average more doses than females, with a statistically significant difference, $p < 0.001$ (Table 6).

Table 1
Characteristics of the student sample.

Age (n = 502)	Mean: 25.2 ± 7.7; Median: 22; Maximum: 62; Minimum: 18.
Gender (n = 502)	
Female	366 (72.9 %)
Male	136 (27.1 %)
Ethnic Groups (n = 502)	
Brown	197 (39.2 %)
White	153 (30.5 %)
Black	142 (28.3 %)
Asian	5 (1 %)
Indigenous	4 (0.8 %)
Other	1 (0.2 %)
Family Income Per Person (n = 502) (n = 502)	
Less than 1 minimum wage	77 (15.3 %)
1-3 minimum wages	235 (46.8 %)
3-6 minimum wages	97 (19.3 %)
6-9 minimum wages	24 (4.8 %)
9-12 minimum wages	14 (2.8 %)
12-15 minimum wages	13 (2.6 %)
More than 15 minimum wages	13 (2.6 %)
Did not know or did not want to inform	29 (5.8 %)

Table 2
Distribution of students by undergraduate course.

Undergraduate Course	Number of Responses (n = 502)
Biological Sciences,	78 (15.5 %)
Speech–Language Pathology	74 (14.7 %)
Pharmacy	62 (12.4 %)
Biotechnology	47 (9.4 %)
Medicine	44 (8.8 %)
Physiotherapy	43 (8.6 %)
Dentistry	39 (7.8 %)
Animal Science	33 (6.6 %)
Public Health	21 (4.2 %)
Gastronomy	20 (4 %)
Nutrition	15 (3 %)
Natural Sciences	9 (1.8 %)
Nursing	9 (1.8 %)
Veterinary Medicine	8 (1.6 %)

Table 3
Psychotropic drugs used with medical prescription, throughout life.

Drug class	Frequency (n = 65)
Antidepressants	55 (84.6 %)
Sedatives/hypnotics	17 (26.2 %)
Anticonvulsants	7 (10.8 %)
Antipsychotics	6 (9.2 %)
Treatment of ADHD	6 (9.2 %)
Mood stabilizers	3 (4.6 %)
Treatment of mania episodes	2 (3.1 %)

Table 4
Frequency of use of psychoactive substances in life and in the last 3 months among students from Area II at UFBA.

Drug	Lifetime use (n = 502)	Last 3 months (n = 502)
Alcohol	418 (83.3 %)	366 (72.9 %)
Cannabis	188 (37.5 %)	100 (19.9 %)
Tobacco	163 (32.5 %)	85 (16.9 %)
Hallucinogens	58 (11.6 %)	21 (4.2 %)
Inhalants	55 (11 %)	22 (4.4 %)
Ecstasy	46 (9.2 %)	14 (2.8 %)
Sedatives/hypnotics (Non-prescription)	42 (8.4 %)	26 (5.2 %)
Antidepressants (Non-prescription)	30 (6 %)	23 (4.6 %)
Methylphenidate (Non-prescription)	28 (5.6 %)	8 (1.6 %)
Other Amphetamines (Non-prescription)	25 (5 %)	9 (1.8 %)
Cocaine	19 (3.8 %)	2 (0.4 %)
Other drugs	19 (3.8 %)	15 (3 %)
Opioids (Non-prescription)	18 (3.6 %)	7 (1.4 %)
Crack	1 (0.2 %)	0 (0 %)

Table 5
Use of psychoactive substances in the last 3 months, by gender.

	Female	Male	p
Alcohol	71.9 %	75.7 %	0.385
Tobacco	14.2 %	24.3 %	0.008
Cannabis	16.9 %	27.9 %	0.006
Cocaine	0.5 %	0.0 %	1.000
Hallucinogens	4.4 %	3.7 %	0.730
Inhalants	4.1 %	5.1 %	0.610
Opioids (Non-prescription)	1.6 %	0.7 %	0.680
Ecstasy	2.7 %	2.9 %	1.000
Methylphenidate (Non-prescription)	1.4 %	2.2 %	0.452
Other Amphetamines (Non-prescription)	1.9 %	1.5 %	1.000
Sedatives/hypnotics (Non-prescription)	6.0 %	2.9 %	0.168
Antidepressants (Non-prescription)	4.6 %	4.4 %	0.912

Table 6
Average number of doses of alcohol ingested by students, by gender.

Gender	Average doses ingested ($p < 0.001$)
Female	3.47
Male	4.90

According to the ASSIST score, the risk of developing problems related to the use of the substances presented in the questionnaire was calculated. Only alcohol, cannabis, inhalants and antidepressants showed a percentage of individuals at high risk of developing problems (Table 7).

The quality of sleep in the last month was also questioned in the survey. Around 32.9 % of participants reported having regular sleep, 28.5 % good sleep, 17.1 % poor sleep, 12.5 % very good sleep, while 9 % very poor sleep. Regarding substance use with the purpose of staying awake for a longer time, 191 (38 %) participants revealed that they had already used some psycho stimulant substance. Regarding students' opinion of how a hectic academic routine may lead to the use of psychoactive substances, 390 (77.7 %) of those who were interviewed disagree with this statement.

4. Discussion

This study evaluated the prevalence of psychoactive substance use among health students at the Federal University of Bahia (UFBA) in Salvador, Brazil. In addition, the risk of developing problems related to the use of these substances was identified. Finally, we examined the relationship between consumption rate and genders to identify which group of students was more susceptible to substance use.

For the demographic characteristics of the sample studied, the predominant gender were females and the average age of students around 25 years old are aligned with the characteristics reported in other studies carried out among students in the health area in Brazil (Sakae et al., 2017; Tockus and Gonçalves, 2008).

The recreational use of psychoactive substances, both for use in life and for use in the last 3 months, showed that the prevalence of alcohol (83.3 % and 72.9 % respectively), cannabis (37.5 % and 19.9 % respectively) and tobacco (32.5 % and 16.9 % respectively) was the highest.

The information present in the national literature revealed that students in the health area have a higher prevalence for the use of these substances. In a private university in southern Brazil, data were collected regarding the use of psychoactive substances by students in the health area. The lifetime prevalence of alcohol use was 90 %, tobacco 35 % and cannabis 26.9 % (Sakae et al., 2017). A study carried out with medical students at a college in Paraná found a lifetime prevalence of alcohol use of 78.4 %, followed by tobacco with 38.6 % and cannabis with 26.1 % (Tockus and Gonçalves, 2008).

Table 7
Risk of development of consumption-related problems.

	Low Risk	Moderate Risk	High Risk
Alcohol	82.1 %	16.7 %	1.2 %
Tobacco	86.5 %	13.5 %	–
Cannabis	81.5 %	17.7 %	0.8 %
Cocaine	99.2 %	0.8 %	–
Crack	99.8 %	0.2 %	–
Hallucinogens	96 %	4 %	–
Inhalants	97 %	2.8 %	0.2 %
Opioids (Non-prescription)	98.6 %	1.4 %	–
Ecstasy	98.2 %	1.8 %	–
Methylphenidate (Non-prescription)	97.2 %	2.8 %	–
Other Amphetamines (Non-prescription)	98 %	2 %	–
Sedatives/hypnotics (Non-prescription)	92.4 %	7.6 %	–

The difference in the present study was the higher prevalence of cannabis in relation to tobacco, which may be a consequence of habit change in the consumption profile between university students. The findings are in line with the results of a study carried out among medical students in Uruguay, revealing that 72.1 % used psychoactive substances. The most used substances in the last 12 months were: alcohol (24.3 %), cannabis (19.3 %) and tobacco (16.4 %) (Pizzanelli et al., 2015).

Cannabis consumption becomes more common in a milieu where there is less judgment towards its users, which is increasingly being observed in the university setting. A survey carried out among students at a university in the state of Minas Gerais showed that students used cannabis in different ways, such as to boost social interaction, to feel as part of the group and to build identity (Silva and Flores, 2018).

The present study also found the consumption of psychotropic drugs without a medical prescription in the last 3 months among students from Biological and Health Sciences at UFBA, such as: sedatives/hypnotics (5.2 %), antidepressants (4.6 %), amphetamines (1.8 %), methylphenidate (1.6 %) and opioids (1.4 %). A survey of nursing students in the United States revealed that excessive drinking was reported by 61 % of participants, 18 % reported using cannabis, and 10 % reported using drugs without a medical prescription (Boulton and O'Connel, 2017).

In a study of French pharmacy students, 21.5 % of participants used illegal drugs, 9.4 % used psychotropic medications, and 3.3 % both psychotropic medications and illegal drugs in the last 3 months. Psychotropic medications were used with a medical prescription (49 %), for self-medication (42.4 %) or for recreational purposes (26.3 %) (Balayssac et al., 2018).

Self-medication can have serious consequences for the patient's health, such as allergic reactions and an increased risk of developing dependence. In addition, this practice can increase the risk of errors related to dose, intoxication, undesirable side effects and drug interactions, confirming that the use of any medication must be under medical prescription (Abrahão et al., 2013).

As for the use of psychotropic medication with medical prescription, 12.9 % of the participants revealed that they had already used it at least at some point in their lives. Among the main classes of drugs mentioned, antidepressants had a prevalence of 84.6 %, while sedatives/hypnotics, such as anxiolytics, had a prevalence of 26.2 % among students who reported this type of use.

This consumption of anxiolytics and antidepressants by the university population is observed in the literature. In a survey carried out with health students at a university in the state of Minas Gerais, symptoms of depression and anxiety were identified in 52.3 % and 41.1 % of the participants, respectively. It was observed that 5.3 % of college students use medication to treat these symptoms. The study concluded that depression and anxiety are prevalent mood disorders among university students and, therefore, the importance of effective measures for monitoring and treatment (Lelis et al., 2020).

A study carried out in the Northeast region of Brazil revealed that the prevalence of anxiety and depression among students in the health area was much higher when compared to the general population. Concluding that these data indicate the urgent need for attention and care of these future professionals, preparing them to be emotionally stable and healthier to deal with individuals and the general population (Leão et al., 2018).

Regarding the number of doses of alcohol consumed, males ingest more doses compared to females, this prevalence was also found in a survey carried out with students in the health area of a higher education institution in Rio Grande do Sul (Pelicioli et al., 2017). Society's pressure also contributes to this type of behavior, as males are usually encouraged to consume alcohol since adolescence, while for females this type of practice is often condemned.

For the use of psychoactive substances in the last 3 months, the results found in the present study revealed a higher consumption of

tobacco and cannabis among men, when compared to women, showing a greater habit of smoking among male students. Other studies carried out among Brazilian college students also found this higher consumption of tobacco and cannabis by males (Lemos et al., 2007; Sakae et al., 2017; Botti et al., 2010; Colares et al., 2009). It was observed that men are more likely to use drugs than women (Caricati and Ferrari, 2021).

A study carried out in Portugal, revealed that some factors such as being male, changing residence when starting university, friendship with people who use illicit drugs and having knowledge about drugs have increased the probability of using illicit drugs (Alves et al., 2021).

Our results revealed 38 % of respondents had already used some psycho stimulant substance to stay awake, such as stimulant drinks, drugs and coffee. In a survey conducted among medical students in the state of Minas Gerais, 52.9 % used these psychostimulant substances, revealing that this type of practice is common among university students (Pires et al., 2018).

According to the ASSIST intervention guide, the reference score for alcohol is: 0–10 no intervention; 11–26 short intervention; 27 or more refer to intensive care. As for the other substances: 0–3 no intervention; 4–26 short intervention; 27 or more refer to intensive care. When determining the level of intervention of the participants of the present study, it was found that a short intervention is necessary for all psychoactive substances, associated with an intervention for intensive treatment in some alcohol (1.2 %), cannabis (0.8 %) and inhalants (0.2 %) users.

Alcohol was the substance that presented the highest proportion of individuals in need of more intensive treatment. Several authors have associated the use of alcohol with a series of risk behaviours, involvement in accidents and violent occurrences, learning difficulties, deficiency in the development and structuring of cognitive-behavioral skills (Mesquita et al., 2008; Wagner and Andrade, 2008).

Analysis of the first and second wave of the US National Epidemiological Survey on Alcohol and Related Conditions (NESARC) revealed that the cumulative probability of transitioning from use to dependence was 67.5 % for nicotine, 22.7 % for alcohol, 20.9 % for cocaine and 8.9 % for cannabis users (Lopez-Quintero et al., 2011). A meta-analysis including 21 studies among people in the general population who have used cannabis showed a prevalence and risk of 22 % (18–26 %) have cannabis use disorder, 13 % (8–18 %) have cannabis abuse and 13 % (10–15 %) have cannabis dependence. The risk of developing cannabis dependence increased to 33 % (22–44 %) among young people who engaged in regular (weekly or daily) use of cannabis. Then, the risk to develop cannabis dependence is lower than nicotine, alcohol, and cocaine, but is greater among those who have initiated at early stages and have more frequent use (Leung et al., 2020).

Short-term cannabis intoxication impairs basal cognitive functions like episodic memory, attentional control, and motor inhibition in a THC-dose-dependent manner, although significant individual differences exist (Kroon et al., 2021). The elevated levels of THC in recreational cannabis nowadays, in comparison to 40 years ago, increase the risk of developing psychotic disorders, in addition to cognitive impairment. A retrospective cohort study done in Brazil confirmed that positive THC-screening, substance use and non-white skin color were significant predictors to induce psychosis. Non-white skin color predicted early disengagement in this sample, probably due to social disadvantages (Scarabelot et al., 2024). Lifetime cannabis use has also been pointed out as an important environmental factor in association with childhood trauma and genetic factors that increase the risk of developing psychosis (Loureiro et al., 2023).

Several commonly misused substances such as alcohol, cocaine, heroin, methamphetamine, and opioids suppress the immune system and affect the immune response. Possible mechanisms for that may include loss of function of natural killer cells, T cells, B cells, neutrophils, dendritic cells, and/or macrophages. The combination of these effects results in an inefficient response to pathogens and limit their subsequent removal (Blackard and Sherman, 2021). Nicotine also reduces T cell receptor (TCR) signaling and suppresses the production and secretion of antibodies (Froushani et al., 2022).

Alcohol can increase the bacterial population and the permeability of the intestinal wall. The enhancement of lipopolysaccharide (LPS) levels in portal and systemic circulation increases inflammatory cytokines, leuko-trienes, and chemokines that produce inflammation and lead to organ dysfunction throughout the body, in particular in the liver and brain. Among a group of alcohol-dependent, the subset that showed signs of intestinal permeability and LPS had higher scores on measures of depression, anxiety, and alcohol cravings and scored worse on measures of specific attention (Bishehsari et al., 2017).

The results show that the majority of students do not assume the fast-paced academic routine as the reason that leads to the use of psychoactive substances, and most of those interviewed also said that they had a regular or good sleep in the last month.

The ACHA-National College Health Assessment (NCHA) survey showed that single users of drugs, such as sedatives, opioids, tobacco, and stimulant drugs were more likely to suffer from insomnia and other sleep disorders. This can increase the effects of sleep deprivation (Palin and McConville, 2021).

The compulsive consumption of any psychoactive substance can lead to the emergence of problems for the user's health, generating cognitive, psychological and social disorders, both for the individual and their families. The majority of the individuals in our sample were young (mean 25.2 $\pm$ 7.7), female (72.9 %), with non-white skin color (69,5 %) and low family income, which intensifies all of these risk factors.

It is worth mentioning that the last large study to evaluate the use of psychoactive substances among students from Biological and Health Sciences at UFBA had been carried out in the 90s. Obtaining updated data on this population is extremely important for developing strategies that aim to prevent substance abuse and reduce harm to users in many places around the world (Sampaio et al., 2024).

The best way to address this issue would involve the creation of a multidisciplinary team composed of doctors, nurses, psychologists, pharmacists, occupational therapists and social workers that can help to identify, monitor and provide guidance regarding substance abuse. This initiative would provide a comprehensive approach covering harm reduction and offering complementary perspectives for the students. The use of visual materials such as posters, social media publications and informative videos can be a valuable complementary tool in this awareness-raising campaign, on account that visual materials have the potential to reach a vast audience and help to deliver messages in a clear way and be more impactful.

Furthermore, the possible damage to cognitive performance, lack of attention and mental capacity of these students, due to the use of psychoactive drugs, can be assessed through some tests, such as the Wisconsin Card Sorting Test (WCST) and the Continuous Performance Test (CPT). These tests have been used previously, which have proved the impact of psychoactive drugs on the performance of drug abusers (Matumoto and Rossini, 2013; Ghosh et al., 2024).

5. Limitations

The results of the present study must be considered in the context of some limitations. We did not have the same numbers of participants between the different courses, with students from the Natural Sciences, Nursing and Veterinary Medicine courses being less represented. However, this selection bias seems to be limited, since the data found on the consumption of psychoactive substances by students of Biological and Health Sciences at UFBA seem to be in agreement with what was observed in the scientific literature.

The rate of response to the survey was low (22.8 %). However, the distribution of respondents according to gender and academic cycle is consistent with the general proportion of students in our institution. Moreover, our study is based on a convenience sample that may impair the representativeness of our results. This limitation is common in

surveys for this type of population and has been observed in most studies on this subject (Busto Miramontes et al., 2019; Bazin et al., 2021).

Our data were assessed before and during the context of the COVID-19 pandemic, however only 8.9 percent of responses were obtained before the pandemic. The effects of this cofactor could not be discriminated within our sample, which may have influenced the drug use profile. However, the overall data shown in this study are compatible with those of other studies that evaluated substance use among university students, which have also been conducted during the COVID-19 pandemic (Lemos-Santos et al., 2023; Gbènankpon et al., 2021).

Considering that information obtained through self-report may be affected by some information bias, it was resolved to use the questions from already validated questionnaires, such as the ASSIST proposed by the WHO and the CEBRID questionnaire. In addition, we believe that the respondents, university students of legal age, are aware of the importance of the veracity of their report. However, it was not possible to verify if the same student had answered twice or more.

6. Conclusions

This study could determine the consumption profile of college students in the Health and Biological Sciences Area at UFBA, with a prevalence of alcohol, cannabis and tobacco use, in that specific order. The consumption profile varied in relation to other studies in the literature, in which cannabis appears most commonly as the third most consumed substance among university students. This may be related to the online application of our questionnaire, making participants feel more comfortable to report all their experiences, thus revealing a possible change in the consumption pattern for this substance.

The results of the ASSIST score, associated with the high prevalence of use of some drugs, indicate the need for local intervention, in order to prevent risky behaviour, damage to mental health and consequences for students' cognition and performance. Educational measures can be taken to reduce the damage to the health of these students, such as the possibility of including topics about the use of psychoactive substances into the university's various undergraduate courses. In addition, monitoring and referring students with mood disorders, such as anxiety and depression.

CRediT authorship contribution statement

Gustavo Reis Sampaio: Writing – review & editing, Visualization, Investigation, Data curation, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Michell Bruno Lago Silva:** Visualization, Writing – review & editing, Formal analysis. **Denis Melo Soares:** Visualization, Project administration, Investigation, Data curation, Writing – review & editing, Supervision, Methodology, Formal analysis. **Suzana Braga-de-Souza:** Writing – review & editing, Visualization, Methodology, Formal analysis, Conceptualization, Writing – original draft, Supervision, Investigation, Data curation.

Informed consent statement

For data collection, the following eligibility criteria for students were adopted: (i) be at least 18 years old, (ii) be enrolled in one of the Biological and Health Sciences undergraduate courses at UFBA, (iii) sign the Informed Consent Form and agree to participate in the research.

Institutional Review Board statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board (or Ethics Committee) of This study was approved by the Research Ethics Committee of the Faculty of Pharmacy at UFBA (CEP-FACFAR/UFBA no. 3,158,711).

Data availability statement

Upon request from the corresponding author.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

Data will be made available on request.

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