

Evaluation of a Brief Mindfulness-based Intervention to Prevent Problematic Substance Use among First-year Medical Students

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ABSTRACT

Introduction. Beginning a degree in medicine involves a significant change in a student's lifestyle, particularly during the early years, since stressful situations are difficult to address. **Objective.** To evaluate the effectiveness of Mindfulness Based Intervention (MBI) in medical students to reduce problematic substance use, stress, anxiety, and depressive symptomatology. **Method.** Experimental study of two groups with simple random assignment in a sample comprising 320 students. **Results.** The mean age of participants was 19; 85% reported having consumed alcohol at some time in their lives, 48% tobacco and 18% cannabis. Alcohol and tobacco use decreased slightly from baseline to follow-up in the group that received a MBI. At the same time, there was a statistically significant decrease in stress in the experimental group and anxiety decreased in both groups with statistically significant changes due to a probable imitation effect. **Discussion and conclusion.** The downward trend in alcohol and tobacco consumption could have intensified if the full intervention program had been completed, as observed in other studies in which five or more MBI sessions were given, achieving significant improvement. The reduction in the level of the variables examined coincides with studies showing the benefits of MBI as a mechanism for emotional regulation to cope with adverse events.

Keywords: Students, anxiety, depression, stress, alcohol, drugs, mindfulness.

RESUMEN

Introducción. Ingresar a la carrera de medicina implica un notorio cambio en el estilo de vida de un estudiante, especialmente durante los primeros años, ya que se presentan situaciones estresantes difíciles de enfrentar. **Objetivo.** Evaluar la efectividad de una intervención basada en la Atención Plena (AP) en estudiantes de medicina para atenuar el uso problemático de sustancias, el estrés, la ansiedad y la sintomatología depresiva. **Método.** Estudio experimental de dos grupos con asignación aleatoria simple. La muestra estuvo conformada por 320 estudiantes. **Resultados.** 69% fueron mujeres y el resto hombres, la media de edad de los participantes fue de 19 años; 85% reportaron haber consumido alcohol alguna vez en la vida, 48% tabaco y 18% cannabis. El consumo de alcohol y de tabaco disminuyó ligeramente de la línea base al seguimiento en el grupo que recibió la AP. A su vez, el estrés tuvo también una disminución estadísticamente significativa en el grupo experimental y la ansiedad disminuyó en ambos grupos con cambios estadísticamente significativos bajo un probable efecto de imitación. **Discusión y conclusión.** La tendencia a la baja en el consumo de alcohol y tabaco pudo haberse fortalecido una vez concluido el programa completo de intervención, como se observó de igual manera en otros estudios en que se impartieron cinco o más sesiones de AP, que mostraron mejoras significativas. La reducción en el nivel de las variables estudiadas coincide con estudios que dan cuenta de los beneficios de la AP al actuar como mecanismo de estabilización emocional frente a eventos adversos.

Palabras clave: estudiantes, ansiedad, depresión, estrés, alcohol, drogas, atención plena.

INTRODUCTION

Starting higher education involves stressful changes in the lifestyle of young people (Tian-Ci Quek et al., 2019) and is compounded by the fact that medical students are extremely competitive (Hill et al., 2018).

A low level of stress can enhance various areas of human behavior. However, when stress is present at high levels, it can be associated with depressive symptomatology, poor academic performance, substance use, the desire to drop out of school and, in extreme cases, suicidal ideation (Marcon et al., 2020; Kumar et al., 2019; Hill et al., 2018).

Recurrent exposure of students to stressful events—of varying intensity—can affect their mental health. Thus, for example, the percentage of depression in medical students ranges from 14.3 to 57.6%, while the percentage for anxiety in this same group ranges from 7.7 to 65.5% (Kumar et al., 2019; Tian-Ci et al., 2019; Zeng et al., 2019; Kunwar et al., 2016; Hope & Henderson, 2014). Hill et al. (2018) conducted a study of 978 medical students, finding that 11.2% described their stress as severe and debilitating, while 68.6% considered it significant yet manageable.

Karyotaki et al. (2020) conducted research on first-year medical students from nine countries, including Mexico, observing percentages of depression and anxiety of 13.4 and 13.1%. Benjet et al. (2019) found that first-year students presented similar percentages indicative of suicide attempt (23%), depression (12.6%) and anxiety (13.6%) to those of international studies.

Stress is also associated with alcohol and drug use (Molodynski et al., 2020). Marcon et al. (2020), Steiner-Hofbauer & Holzinger (2020) and Kushwaha et al. (2019) found that 59.6% of a sample of medical students reported alcohol use, 28.2% tobacco use and 11.9% marijuana use. In the case of Mexican students, 46% were found to consume alcohol in alarming amounts (Puig-Nolasco et al., 2011).

Given the evidence of the problems described, programs have been developed to enhance mental health and reduce anxiety, depression and stress levels (Slavin & Chibnall, 2016), as well as suicidal ideation (Witt et al., 2019). Medical students and certain schools have begun to include self-care programs in their syllabuses (Hassed et al., 2008) to provide students with strategies to manage stress and reduce drug use.

One approach used is the Mindfulness-Based Intervention (MBI), whose philosophical, epistemological, theoretical, and phenomenological tenets are based on Buddhism and meditation. It focuses on awareness, attention, acceptance, and remembrance; promotes the observation of the present reality, the understanding of the body and mind, and provides a new understanding of the experiences, sensations, emotions, and thoughts of each person without judgment (Oró et al., 2021; Peláez et al., 2021; Vázquez-Dextre, 2016; Nyanaponika, 1962).

MBI comprises two components: self-regulation of attention and coping with experiences. According to this approach, it is assumed that it is possible to enable people to reduce stress, anxiety, depression and substance use (Tanay et al., 2012). MBIs promote physical and emotional well-being, which is why they have been used in various therapeutic and educational contexts, sometimes with the incorporation of electronic devices (Diez & Castellanos, 2022; Errasti-Pérez et al., 2022; Döllinger et al., 2021; Wielgosz et al., 2019; Kabat-Zinn, 2015; Vettese et al., 2009; Goldin & Gross, 2010).

Several studies have observed an improvement in those who received an MBI, in comparison with control groups with stress, depressive, somatic, anxious and emotional exhaustion symptoms, in the perception of their quality of life, perceived difficulty, personal and social well-being, burnout and, of course, drug use. They were also observed to have better treatment adherence (Félix-Junior et al., 2022; Bazzano et al., 2022; Kriakous et al., 2020; Chmielewski & Łuczyński, 2021; Oró et al., 2021; Zemestani & Fazeli Nikoo, 2020; Buizza et al., 2020; Kwok et al., 2019; Lomas et al., 2018; Ruiz-Fernández et al., 2019; Spinelli et al., 2019).

Likewise, studies such as those by Nogueira et al. (2022), López et al. (2021), Santiago & Urcuhuaranga (2021), Zúñiga et al. (2021), Alvarado & Daza (2020) and Buizza et al. (2020), have observed positive results in the improvement of stress management, burnout, resilience, concentration, attention, anxiety, motivation, self-acceptance and social support among medical students.

Single et al. (2019) found that behaving with awareness, nonjudgment, and nonreactivity to internal experience predicted decreased alcohol consumption, which was mediated by low levels of emotional psychopathology.

Li et al. (2017) conducted a systematic review of studies evaluating MBI interventions for substance use. They observed a reduction in substance use, craving, and withdrawal symptoms at the end of treatment and at follow-up in subjects who had received the intervention compared to those who had received treatment as usual, such as relapse prevention, cognitive behavioral therapy and/or joining a support group. This review was updated by Korecki et al. (2020), finding the same results.

Finally, it has been observed that MBI can reduce the likelihood of drug and alcohol use among students directly or through emotion regulation (Garland et al., 2022; Nosratabadi & Halvaeipour, 2019; Black et al., 2011).

The aim of the present article was therefore to evaluate the effectiveness of an MBI in medical students to prevent problematic substance use, stress, anxiety and depressive symptomatology.

METHOD

Study design

We used an experimental study of two groups with simple random assignment.

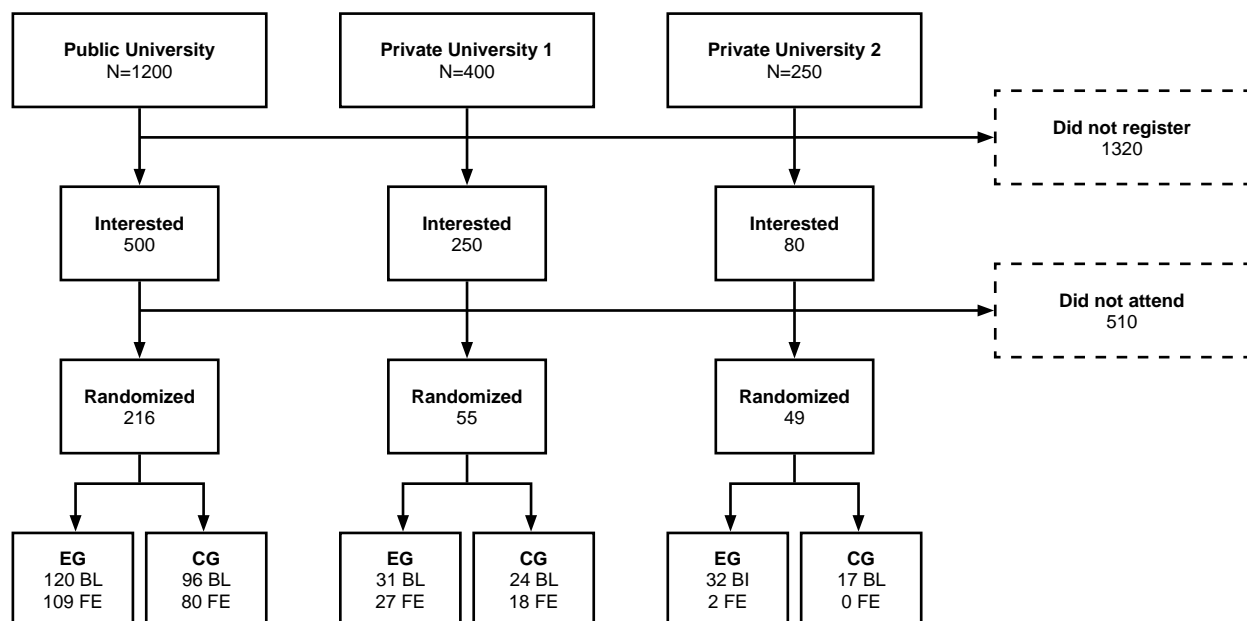
Sample description

The study was conducted at three universities in Mexico City, one public and two private, from October 2019 to March 2020. A total of 2,150 students were invited to participate, of which 830 showed interest in participating in the workshops. Three hundred and twenty were randomized and divided into two groups: experimental and control, after filling in the informed consent form, meeting the inclusion criteria and completing the baseline (BL), and 236 completed the final evaluation (FE) (Figure 1).

Measurements

The questionnaire comprised the following six sections:

1. *Sociodemographic data.* This section comprised 16 questions on sex, age, pregnancy status, date of birth, place of birth, school, group, medical diagnosis, specific diagnosis, medication intake, specific medication, pharmacological treatment for psychiatric or neurological problems, name, email, cell phone, and other means of contact. For the purposes of the study, the seven main variables are reported in the results and tables sections: sex, age, birthplace, school, medication intake, medical diagnosis, pharmacological treatment.
2. *Perceived Stress Scale (PSS).* Developed by [Cohen et al. \(1983\)](#), this scale assessing the level of perceived stress during the past month comprises 14 items with a five-point Likert-type response format (0 = never to 4 = very often). The total PSS score is obtained by inverting the scores of items 4, 5, 6, 7, 9, 10 and 13 and adding the 14 items, with a higher score corresponding to a higher level of perceived stress. The results of the adaptation tested in a Mexican population, conducted by [González et al., \(2007\)](#), indicate adequate internal consistency ($\alpha = .83$).
3. *Beck Anxiety Inventory (BAI).* Comprises 21 items describing common anxiety symptoms and assesses the degree of distress of each item during the past week on a 4-point Likert-type scale (0 = not at all to 3 = severely). According to [Beck et al. \(1993\)](#), the BAI showed internal consistency of .92. The Mexican version for adults has obtained alphas of .94 and .83 ([Hernández et al. 2022](#); [Robles et al., 2001](#)).
4. *Beck Depression Inventory (BDI).* Developed by [Beck et al. \(1987\)](#), this inventory comprises 21 items describing common depression symptoms, used to evaluate the degree of distress of students in the past week on a 4-point Likert-type scale (0 = absence to 3 = maximum severity). The total score is obtained from the sum of the items,



Note: EG= Experimental group, CG= Control group, BI= Baseline, FE= Final evaluation.

Figure 1. Consort Flow Diagram.

with a score above 10 indicating the presence of depression. Jurado et al. (1998) translated, adapted, and standardized the inventory for the Mexican population, with adequate concurrent validity ($r = .70$) and high internal consistency ($\alpha = .87$), while Hernández et al. (2022) obtained internal consistency of .92.

5. *Five Facets of the Mindfulness Questionnaire (FFMQ-M; Baer et al., 2006; Baer et al., 2008)*. The questionnaire comprises 39 items with a 5-point Likert-type response format (1 = never to 5 = very often), measuring mindfulness, based on five main facets: “Observing,” “Describing,” “Acting with Awareness,” “Not judging the internal experience,” “Not reacting to the internal experience” and “Taking a step back.” The questionnaire has been validated in the Spanish population by Cebolla et al. (2012) and in the Mexican population by Meda et al. (2015).
6. *Alcohol, Tobacco and Substance Use Screening Test (ASSIST)*. This test identifies the use of tobacco, alcohol, marijuana, cocaine, amphetamine-type stimulants, inhalants, sedatives, hallucinogens, opiates, and other drugs. It comprises eight questions enquiring about use and associated problems in the past three months (Ali et al., 2002). Each substance is assessed for a risk score: low (0-3 points), moderate (4-26 points) and high risk (> 26 points). International studies have reported both validity and reliability, with a test-retest coefficient of .58-.90 and internal consistency of .80. Internal consistency of .87 was found in the Mexican population (Tiburcio et al., 2016; Khan et al., 2011).

Procedure

An agreement was initially sought with three universities. Once this had been established, first-year medical students were invited to participate through a poster and information sessions, the standard pre-pandemic means employed at institutions for this purpose. Interested students were offered more information about the project and invited to participate in the study and to sign the informed consent form. The control and experimental groups were formed with students from the three universities and BL measurements taken of each group. The experimental group received an intervention based on MBI, through five two-hour sessions. At the end of the intervention, the final evaluation was administered, using the same instruments as in the BL.

Inclusion and exclusion criteria

- *Inclusion criteria:* First-semester medical students at the time of the study, who agreed to participate voluntarily.

- *Exclusion:* Presence of severe pathology or receiving any type of psychotherapy at the time of the study or in the past six months.
- *Elimination:* failure to complete the registration and/or the interventions, and conditions that prevented them from answering the questionnaires or participating in the interventions (such as headaches, wakefulness, nausea, and the influence of psychoactive substances).

Data analysis

Frequencies and measures of central tendency were obtained for each question. To establish comparisons by demographic data, X^2 or Student's t analyses were performed according to the level of measurement of each variable. Analysis of variance (ANOVA) was calculated using treatment condition as the independent variable. Data were analyzed using the IBM SPSS v26 statistical software. For the purposes of the analysis, the control groups from the three universities and the experimental groups were combined.

Ethical considerations

The present study constituted minimal risk research because the main objective was to promote the emotional well-being of participants. The original research protocol was approved by the Fundación Gonzalo Río Arronte and the Ethics Committee of the Medicine Faculty (FM/DI/098/2019).

RESULTS

Sample characteristics: 137 (42.8%) of the randomized students were in the control group and 183 (57.2%) in the experimental group. Most of the participants were female (69.4%), with a mean age of 19 ($SD = 1.5\pm$). Regarding their place of birth, 51% were originally from Mexico City and 67.5% studied at a public university. It is worth noting that 13.1% reported taking some form of medication, 15.5% had been given a medical diagnosis and 5.9% were under pharmacological treatment for a psychiatric or neurological problem (Table 1).

In terms of substance use, alcohol was the substance most commonly reported by students, with 85.3% of lifetime users, followed by tobacco (47.8%) and cannabis (18.4%). Although the use of other substances was reported, percentages were so low that they were not included in the following analyses (Figure 2).

With respect to the difference in risky consumption between the control and experimental groups, significant differences were only found in tobacco use levels, with 10.1% of members of the experimental group presenting a high risk of tobacco dependence (Table 2).

Table 1
Demographic Characteristics of Sample

	Control n=137		Experimental n=183		Total N=320		X /gI ²
	f	%	f	%	f	%	
Sex							
Male	41	29.9	57	31.1	98	30.6	.055/1
Female	96	70.1	126	68.9	222	69.4	
Age							
17-18	55	40.1	88	48.1	143	44.7	8.834/2*
19-20	67	48.9	61	33.3	128	40.0	
21 or older	15	10.9	34	18.6	49	15.3	
Birthplace							
Mexico City	69	70.4	95	68.8	164	69.5	2.869/2
Mexico state	23	23.5	26	18.8	49	20.8	
Another	6	6.1	17	12.3	23	9.7	
Mexican state							
University							
Public	96	70.1	120	65.6	216	67.5	1.569/2
Private	41	29.9	63	34.4	104	32.5	
Currently taking medication							
No	123	89.8	155	84.7	278	86.9	1.774/1
Yes	14	10.2	28	15.3	42	13.1	
Medical diagnosis							
No	117	85.4	153	83.6	270	84.4	.191/1
Yes	20	14.6	30	16.4	50	15.6	
Receiving pharmacological treatment for a psychiatric/neurological problem							
No	131	95.6	171	93.7	302	94.4	.700/1
Yes	6	4.4	12	6.6	18	5.6	

* $p \leq .05$.

Stress underwent a statistically significant decrease in the experimental group; and anxiety decreased in both groups with statistically significant changes. However, depression showed a statistically significant increase in both the experimental and control groups (Table 3).

It is important to note that although there were no statistically significant differences in substance use, there was a slight decrease in tobacco and alcohol use in the baseline follow-up of the group that received the MBI.

DISCUSSION AND CONCLUSION

The aim of the present study was to evaluate the effectiveness of a Mindfulness-based intervention in medical students to prevent stress, anxiety, depressive symptomatology, and problematic substance use. The study was conceptualized and undertaken in keeping with the mental health status of students at the levels of the pre-pandemic context. In this regard, 85% of the students surveyed reported lifetime use of alcohol, 47.8% of tobacco and 18.4% of cannabis.

The literature review responds to a limited context regarding studies focused on substance consumption in first-year medical students in Mexico City prior to lockdown. However, some international studies (Martínez et al., 2018; Haas et al., 2018; Sommet et al., 2012; Akvardar et al., 2003) report similar percentages to this study, while others report different percentages (Lemos-Santos et al., 2024; Fernández et al., 2018; Newbury-Birch et al., 2000). Since the difference in results could be due to the different sample populations, further research is required in Mexico.

Although no statistically significant decrease in substance use was found after participants had received the intervention, a slight decrease in alcohol and tobacco use was observed in the experimental group. This trend may have increased with the completion of the full intervention

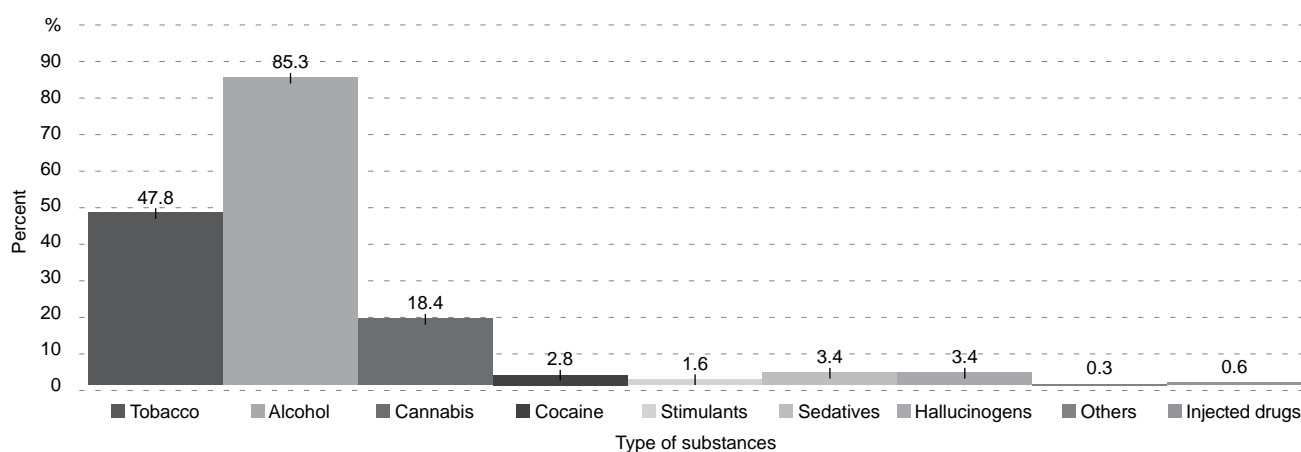


Figure 2. Lifetime Substance Use

Table 2
Consumption Risk

	Control n = 137		Experimental n = 183		Total N = 320		X /gl ²
	f	%	f	%	f	%	
Risk of tobacco use	5	13.9	14	28.6	19	22.4	7.466/2*
Low	31	86.1	30	61.2	61	71.8	
Moderate	---	---	5	10.1	5	5.9	
High							
Risk of alcohol consumption	70	76.9	110	80.9	180	79.3	.545/2
Low	20	22.0	25	18.4	45	19.8	
Moderate	1	1.1	1	0.7	2	0.9	
High							
Risk of cannabis use	15	75.0	31	82.6	46	79.3	.346/1
Low	5	25.0	7	18.4	12	20.7	
Moderate	---	---	---	---	---	---	
High							

* $p \leq .05$.

program (Baeza-Velasco et al., 2020; Black et al., 2011), as significant improvements have been observed in studies where more than five sessions of MBI were provided, (Barros et al., 2021; Zamboni et al., 2021; Nawi et al., 2021; Goldberg et al., 2021; Wupperman et al., 2019; Cavicchioli et al., 2019).

The results also indicate that stress symptoms decreased with statistically significant differences in the group receiving the MBI, consistent with what has been reported in other studies with medical students (Polle, & Gair, 2021; Daya & Hearn, 2017; Khoury et al., 2015), in which students' improvement was attributed to increased awareness, and recognition of levels of tension, pain, bodily and mental rigidity.

The literature points out that although MBI achieves positive results in cross-sectional studies, these studies are still considered to have certain limitations in regard to the safety of medium and long-term effects, so it is suggested that actions designed to narrow these gaps be implemented, as this could enhance the effectiveness of MBI in this population (Sekhar et al., 2021).

At the same time, a decrease in anxiety symptoms was found, coinciding with the systematic review by Krishnan et al. (2022), in which significant decreases were observed in various studies worldwide. Anxiety is regarded as one of the most prevalent problems (Aljuwaiser et al., 2023) and one of the most intractable among students themselves, as they perceive it as "a complication inherent to the nature of the degree course" due to the academic workload, the competitiveness of the environment and the uncertainty regarding job opportunities in the future (Tian-Ci et al., 2019; Hill et al., 2018).

The study was conducted at the beginning of the pandemic (October 2019-March 2020), a period that overlapped with the first cases of COVID 19 in Mexico (January-February 2020) as reported by WHO (2020) and the Ministry of Health (2020). The outbreak of the pandemic may have contributed to the significant increase in depressive symptoms in both the control and experimental groups, as the uncertainty and fear caused by the announcement of lockdown affected medical, paramedical and trainee staff more than the general population or students in other degree courses (Piñel et al., 2021; Shao et al., 2020). The uncertainty and fear were partly due to concerns about the negative impact of COVID-19 on education, employment and their future (Xie et al., 2021).

This study has several limitations. It began before the pandemic and was conducted at the beginning of the latter, which did not allow for effective follow-up of participants. Moreover, the announcement of lockdown may have influenced answers in the evaluations of the two groups. Due to the limited availability of universities and the restrictions

Table 3
Results by Control and Experimental Group

	Baseline				Final Evaluation				Total				t	p
	CG		EG		CG		EG		BL		FE			
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD		
Variables														
Stress	34.04	4.09	34.13	4.51	33.03	5.43	32.96	6.37	34.09	4.33	32.99	5.99	6.713	.010
Anxiety	17.94	10.86	15.88	11.00	15.33	11.71	14.39	11.50	16.74	10.97	14.78	11.57	14.574	< .001
Depressive symptomatology	52.15	10.25	54.06	9.20	55.16	11.12	57.23	10.33	53.27	9.68	56.37	10.69	1093.20	< .001
Tobacco	8.00	4.77	9.42	8.22	9.50	5.64	8.50	7.24	9.00	7.26	8.80	6.66	.077	.785
Alcohol	12.16	8.84	8.85	7.63	12.00	7.64	8.64	7.75	9.85	7.92	9.65	7.67	.022	.885

Note: EG = Experimental group; CG = Control group; gl = 1.

imposed by lockdown (Delgado et al., 2021), the eight sessions originally planned were reduced to five. However, the literature suggests that seven or more sessions are required for the internationalization of MBI principles in participants (Oró et al., 2021).

Given the importance of positively impacting the mental health of medical students, recommendations for future research include the following:

1. The use of manuals resulting from this experience, such as the “Mindfulness Instructor’s Manual for Mental Health Professionals” and the “User’s Manual on the Mindfulness Technique for students and the general public.”
2. Include other study variables, such as suicidal ideation, which can be by MBI (Bazzano et al., 2022).
3. Incorporate MBI into the curriculum, so that it influences all levels of training, to prevent drop out and emotional and behavioral problems derived from the strain inherent to professional training.

Finally, it should be noted that the COVID-19 epidemic was a phenomenon that was not considered at the beginning of the research. There were no indicators to suspect its outbreak or the subsequent lockdown stage, as a result of which students lost contact with the research team and each other, due, among other causes, to dropping out of their degree courses, returning to their places of origin (the provinces) and being assigned to hospitals to attend patients with COVID-19. In addition, the use of social networks was not as widespread as it is today, which made data collection difficult. However, despite these setbacks, relevant data supporting the efficacy of MBI for the management of substance use were obtained.

The results achieved through a reduction of stress and anxiety symptoms coincide with other studies showing the benefits of MBI, which serves as an emotional regulation mechanism in the face of adverse events. Likewise, substance use showed a downward trend. However, since these findings are not conclusive for this study population, it is suggested that the subject be further explored with other medical students, who present frequently situations of emotional imbalance.

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Conflict of interest

The authors declare that they have no conflicts of interest.

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