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Effectiveness of a yoga-based intervention on academic burnout syndrome in medical students: A pilot study

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Abstract:

BACKGROUND: Approximately 40% of medical students in Mexico experience academic burnout syndrome (ABS), highlighting the lack of institutional strategies to prevent or mitigate this phenomenon, leaving students vulnerable. The aim of this study is to determine the effectiveness of a yoga-based intervention (YBI) in medical students with ABS.

MATERIALS AND METHODS: A quasi-experimental study was designed for medical students whose burnout levels were assessed using the MBI-SS. Subsequently, those students with ABS participated in an YBI for six weeks, with a weekly session of 60 minutes, incorporating postures, body movements, and guided breathing to induce a meditative state and deep relaxation. At the end of the intervention, burnout levels were reassessed. Qualitative variables were analyzed as frequencies and percentages, while quantitative variables were analyzed as means and standard errors of the mean. Paired samples *t* test was used to compare all dimensions of ABS scores before and after YBI, with $P \leq 0.05$ considered statistically significant. All data were analyzed using SPSS software.

RESULTS: The prevalence of ABS was found to be 10.6%. After YBI, 87.5% of students showed changes in scores across all dimensions of ABS, emotional exhaustion decreased from 20.13 ± 0.9 to 12.38 ± 1.9 ($P = 0.002$), depersonalization decreased from 9.0 ± 0.7 to 5.8 ± 1.0 ($P = 0.025$), and academic efficacy increased from 16.7 ± 0.9 to 23.8 ± 2.1 ($P = 0.019$).

CONCLUSIONS: YBI was effective in reducing ABS scores in medical students, consistent with public health goals. Further studies are needed, and consideration should be given to incorporating wellness programs as an integral part of medical education to address mental health issues are recommended.

Keywords:

Medical student, meditation, mental health, preventive medicine, school burnout

Introduction

Academic burnout syndrome (ABS) manifests as exhaustion from academic demands, with an increasing lack of interest in educational performance, pessimistic perceptions, and feelings of adequacy competence as a student.^[1,2] The increase in ABS among university students has been observed in recent years. This is particularly evident among students prone to mood swings, those affected by psychopathologies, and those with low levels of resilience.^[3-5]

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Based on several meta-analyses involving more than 44,000 medical students, a general prevalence of burnout ranging from 37.2% to 44.2% has been reported.^[6,7] In Mexico, these prevalences fluctuate between 15% and 50%^[8-10] which means that it affects the well-being of those who should be providing health care to society by decreasing honesty and integrity,^[11] increasing the desire to leave the profession,^[5] professional dissatisfaction, the abuse of psychoactive substances^[12] and has also been associated with suicidal ideation.^[12,13]

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Despite the alarming numbers on the prevalence and consequences of burnout among medical students, research on effective interventions for prevention and treatment, as well as implementation of coping strategies to support mental health, is needed. Therefore, this study seeks to address this gap in the scientific literature by examining the effectiveness of a yoga-based intervention in reducing burnout among medical students.

Materials and Methods

Study design and setting

A prospective longitudinal quasi-experimental study was designed in medical students from a public university in southern Veracruz, Mexico, from August 2023 to January 2024.

Study participants and sampling

A non-probabilistic sampling method was used. All students ($n = 300$) enrolled in the program from year one to year three, regardless of gender, were invited to participate. Those who voluntarily agreed, signed an informed consent form, and completed all inventories were included. Exclusion criteria included students with preexisting medical conditions or illnesses that could interfere with physical activity, as well as those who regularly practiced yoga. In addition, students who still needed to complete the yoga program, inventories, or requested withdrawal from the university were removed from the study. A total of 141 responses were received for a response rate of 47%.

Data collection tool and technique

Personal information data

This questionnaire included name, age, gender, current academic year, and questions about diagnosed conditions/illnesses that might interfere with physical activity and current yoga involvement.

Maslach burnout inventory—student survey (MBI-SS)

The MBI-SS is an adaptation of the MBI^[14] specifically designed to assess student burnout. It consists of 15 questions organized into three subscales assessing emotional exhaustion, depersonalization, and academic efficacy.

The MBI-SS is considered the gold standard, making it a widely used, valid, and reliable instrument in research among university students worldwide.^[5,6,15,16] Each item is scored on a scale from 0 (never) to 6 (always). Based on the score obtained, it is divided into the three dimensions as follows: emotional exhaustion: low from 0 to 9, moderate from 10 to 14, and high >14; depersonalization: low from 0 to 1, moderate from 2 to 6, and high >6; and academic efficacy: low <22, moderate from 23 to 27, and high >28. For a student to be considered to meet burnout

criteria, they must have low personal efficacy scores and high emotional exhaustion and depersonalization scores.^[14]

For this study, comparisons were made using a scoring approach of the MBI-SS rather than the classification approach used in previous research.^[16-18] This decision was based primarily on the sensitivity to individual variability, which allows for excellent resolution of measurement and reliable statistical analysis.

Yoga-based intervention (YBI)

Yoga exerts a down-regulatory effect on the sympathetic nervous system (SNS) and the hypothalamic-pituitary-adrenal (HPA) axis in response to stress,^[19] thereby mitigating the adverse effects on brain function caused by chronic exposure to elevated cortisol levels.^[20] In addition, this practice has been shown to have psychological benefits such as reducing anxiety, depression, and stress.^[21-23]

The YBI was structured with sessions lasting up to 60 minutes and incorporating postures, body movements, and guided breathing to induce a meditative state and deep relaxation.^[22-24] It consisted of a preparatory, initial, central, and relaxation sequence. The Yoga Alliance Certified Yoga Accessible for All Public instructor began with an energetic and physical diagnosis of the group, asking each participant to describe their energy level and physical state. This informed the preparatory sequence of deep breathing and rhythmic movement to balance

This was followed by an initial sequence of exercises based primarily on movements of the arms, legs, and neck joints to warm up the joints for the central sequence. The central sequence combined postures such as mountain pose and forward fold, synchronous movements, and deep breathing to prepare participants for deep relaxation. The session concluded with a relaxation sequence focused on guided diaphragmatic breathing and mindfulness practices.

Procedure

The objectives and scope of the project were disseminated to medical students through group classroom visits and official faculty social media platforms, such as Facebook and WhatsApp, using informative infographics. The importance of promoting the mental health of medical students due to the academic demands, stress and pressure associated with their training, as well as the effects of ABS and its impact on well-being were highlighted.^[6-14] In addition, students were provided with a link or QR code leading to the initial assessment (pre-YBI) via a digital form on Google Forms containing sociodemographic forms and the MBI-SS.

After the data were analyzed, all students were informed of the results of the MBI-SS. Those students who met the criteria for burnout were invited to participate in the YBI, and they were also informed that the practice of yoga in various modalities may be effective as a short-term intervention to reduce stress, anxiety, or burnout, as has been demonstrated in various populations.^[21-24] The YBI was delivered by a certified instructor with a prearranged schedule. Six sessions of approximately 60 minutes each were conducted weekly, providing participants with yoga techniques and digital resources, and always encouraging them to practice independently for the rest of the week. All sessions were held at university facilities, and attendance was recorded, with participants who did not complete the entire program excluded from the study analysis.

After completing the YBI, participants were administered the MBI-SS again (post-YBI) using the same digital form. The resulting data were collected, analyzed, and interpreted [Figure 1].

Statistical analysis

Qualitative variables were analyzed as frequencies and percentages, while quantitative variables were analyzed as means and standard errors of the mean. Comparisons of burnout pre- and post-YBI were made using the

paired samples *t* test. Tests were selected based on the normality and homoscedasticity of the variance. All data were analyzed using SPSS 25 for Mac OS (IBM Corp., Armonk, NY, USA). A 95% confidence level was used for all statistical tests, with $P \leq 0.05$ considered statistically significant.

Ethical consideration

Ethical approval was obtained from the Research and Ethical committee of the Faculty of Medicine of the Universidad Veracruzana, Minatitlán Campus (FOLIO: F-012-CI-2023). In addition, the General Health Law in articles 13, 14, 16, 20, and 36, as well as the principles of the Declaration of Helsinki and the General Health Law of Mexico, chapters 96, 100, and 102, regarding research were followed.

Results

Of the 300 students who comprised the first through third year population of the Medical Surgeon educational program, 141 (47%) agreed to participate. Of these, 76 (53.9%) were female and 65 (46.1%) were male, with an average age of 19.5 years. Regarding their academic year, 62 (43.9%) were first year students, 53 (37.5%) were second year students, and 26 (18.4%) were third year students.

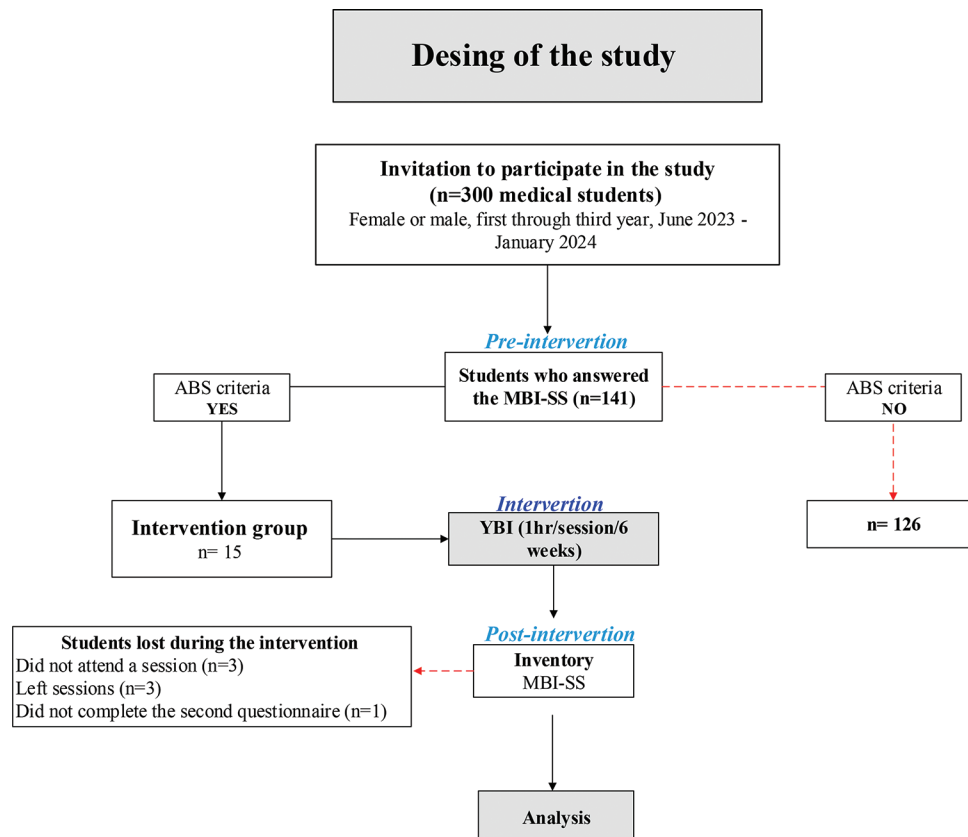


Figure 1: Flow diagram—quasi-experimental study procedure

In terms of the ABS, 35 (24.8%) students were identified with high depersonalization, 68 (48.2%) with high emotional exhaustion, and 36 (25.5%) with low academic efficacy. This led to the determination that 15 (10.6%) students met the criteria for burnout (pre-YBI).

Upon completion of the YBI, only eight students completed the intervention, with 6 (75%) being female and 2 (25%) male. A second administration of the MBI-SS (post-YBI) suggests that the majority (87.5%, $n = 7$) of students decreased in all dimensions assessed [Table 1].

Post-YBI, there was a 39% decrease in emotional exhaustion and 36% decrease in depersonalization, along with a 70% increase in academic efficacy compared to pre-YBI [Figure 2].

Discussion

This study aimed to determine the effectiveness of implementing yoga-based interventions on medical students with academic burnout syndrome. It was

observed that following the YBI, students exhibited changes in all dimensions of ABS, suggesting that YBI could be considered effective in reducing ABS among students.

The present study found a lower prevalence of ABS compared to global findings, which typically report rates around 40%.^[6,7] Similarly, national studies show a wider range from 15% to 50%.^[8-10] These discrepancies may be attributed to several factors, including differences in measurement scales, sample sizes, and diagnostic criteria

Table 1: Comparative analysis between the points before and after attending the yoga-based intervention (YBI)

ABS subscales	YBI	Mean \pm SEM	Statistic and <i>P</i>
Emotional exhaustion	Pre	20.13 \pm 0.93	$t=4.743$, $P=0.002^*$
	Post	12.38 \pm 1.96	
Cynicism	Pre	9.00 \pm 0.731	$t=2.818$, $P=0.025^*$
	Post	5.87 \pm 1.00	
Inefficacy	Pre	16.75 \pm 0.901	$t=3.005$, $P=0.019^*$
	Post	23.88 \pm 2.12	

*Significant differences between MBI-SS scores pre- and post-YBI, analyzed by paired *t* test. YBI: Yoga-based intervention; SEM: standard error of mean

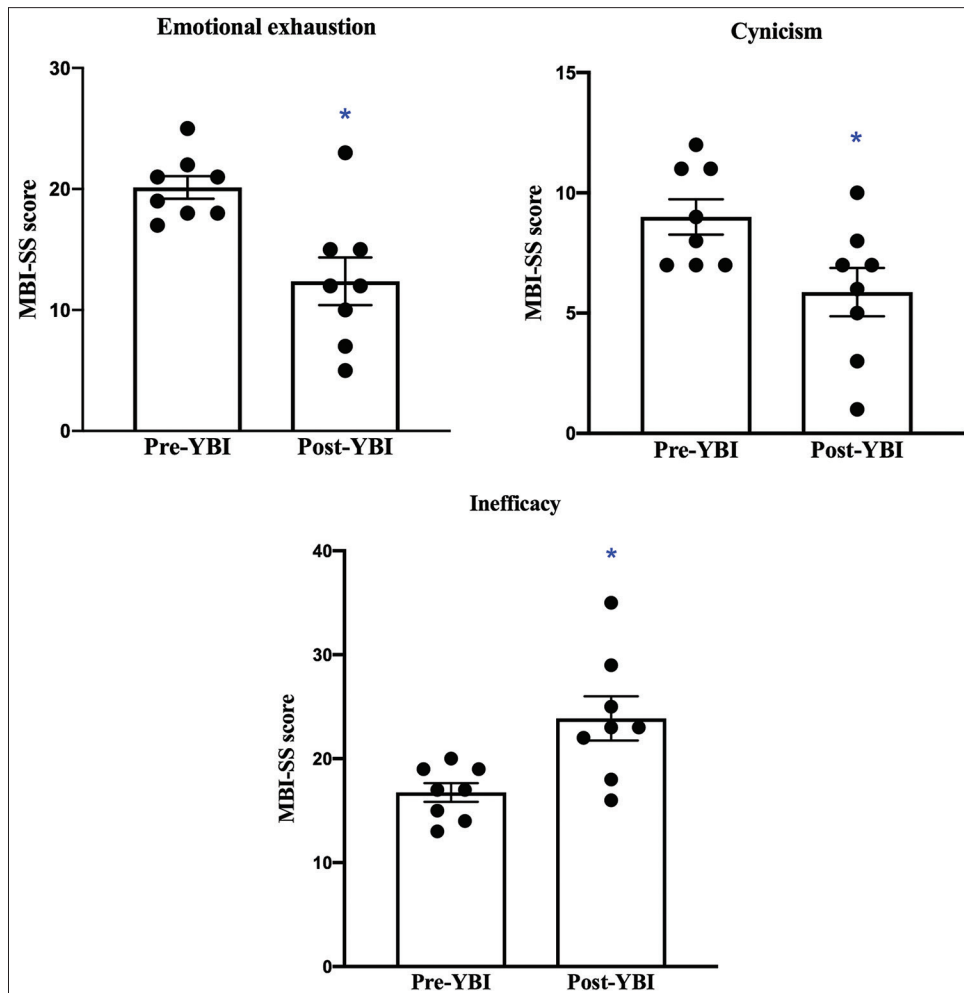


Figure 2: MBI-SS scores before and after Yoga-Based Intervention (YBI) in ABS dimensions

for burnout. In particular, diagnoses may be based on the adjustment of only one, two, or all three dimensions of the MBI-SS.^[6,7,16] Furthermore, the timing of measurement should also be considered, as elevated levels of anxiety and ABS are more commonly observed near and during assessment periods.

Building on previous research, our findings consolidate the potential of yoga-based interventions (YBI) as a powerful tool for reducing burnout in university students and professionals.^[21-26] Following the implementation of the YBI program, our study not only suggests a significant change in all dimensions of burnout, decrease in emotional exhaustion, depersonalization, and increases in personal efficacy, but is also consistent with previous research demonstrating the effectiveness of YBI in reducing stress, anxiety, and improving overall mental health in diverse populations.^[21,23-28]

Studies of workers and medical students have shown significant reductions in fatigue, pain, burnout, and stress, as well as improvements in flexibility, strength, quality of life, and overall well-being.^[25-28] This consistency strengthens the argument that YBI can be a short-term intervention with substantial benefits for academic performance, managing stress, improving physical health, and promoting overall well-being in a variety of professional settings not only just for university students, but potentially for individuals facing burnout in other contexts as well.^[23-29]

Emerging evidence suggests that the practice of yoga may lead to neuroplastic changes in the brain, affecting regions associated with stress regulation, mood, and cognitive function. Studies using neuroimaging techniques have observed increased gray matter volume in the prefrontal cortex (PFC), a region critical for decision-making, emotional regulation, and focus—following yoga interventions.^[30] Conversely, a reduction in gray matter volume has been observed in the amygdala, a region involved in processing fear and emotion.^[19] These changes suggest that yoga may enhance our ability to manage stress and negative emotions while strengthening cognitive control.

In addition, yoga may affect the production of neurotransmitters such as gamma-aminobutyric acid (GABA), which plays a key role in inhibiting overactive neurons and promoting relaxation.^[20,30,31] Increased GABA activity has been associated with reduced anxiety and improved mood regulation.^[30,31]

Mitigating ABS through YBI has significant implications for medical education. While experiencing lower levels of burnout, medical students tend to enjoy a better quality of life, adopt important ethical values, and fully

develop as healthcare professionals, demonstrating greater commitment, efficacy, and empathy. Beyond simply reducing burnout, YBI can promote improved well-being, stronger ethical values, enhanced professional development, reduced risk of psychopathology and substance abuse, and a more positive learning environment. These benefits extend beyond the well-being of individual students and positively impact the future of medical practice and patient care.^[31-33]

The successful implementation of YBI underscores the importance of incorporating holistic and self-regulatory approaches into medical student wellness programs. Evidence suggests that this practice not only improves patient care, but also provides students with practical tools to cope with the inherent challenges of daily medical practice that they will face.^[32-34] In addition, it significantly reduces stress levels, decreasing cortisol and symptoms of anxiety, depression, and burnout in approximately 30% of medical students, while improving sleep quality and resilience, attention, and working memory in students.^[24,25,29,32-35]

The development of structured programs specifically designed to reduce burnout and improve student well-being has been undertaken in medical schools worldwide. Dyrbye *et al.* (2019)^[36] conducted a study of 32 medical schools in the USA and detailed that approximately 60% included wellness activities in their curriculum with critical activities such as music therapy, mindfulness, stress management techniques, social events (movie nights, art activities, talent competitions, board games), sports competitions, yoga, and others. Additionally, programs that focus on self-compassion, resilience building, and healthy lifestyle habits have been shown to improve emotional regulation, decrease burnout symptoms, and enhance overall well-being in this population.^[29,30,37-39]

Recently, the Medical College of Wisconsin developed a comprehensive mandatory curriculum to promote student well-being and prepare first- and second-year medical students for the emotional challenges of the medical profession.^[40] This curriculum emphasizes that self-care is as important as clinical and scientific skills. It is based on practical approaches such as mindfulness training and faculty instructors sharing personal experiences small—during group didactic sessions. In the first years of its implementation, it was found that 70-84% of students who participated in the program developed improved self-care skills, mindfulness, and support seeking.^[40]

On the other hand, the Liaison Committee on Medical Education and the Commission on Osteopathic College Accreditation in the USA have proposed

expanding quality standards by integrating well-being as a fundamental part of professional education, asking institutions to assess or address negative factors that affect students' well-being.^[41]

Our research highlights the novelty of its implementation, as there is currently a paucity of evidence on the application of interventions to treat or prevent burnout syndrome among medical students in Mexico, which provides the basis for future implementation of the YBI among medical and other students nationwide. The lack of similar studies in Mexico underscores the need for more comprehensive research on the impact of such interventions on the mental health of university students, especially those in the health sciences. Identifying such outcomes can significantly contribute to the development of implementation strategies aimed at improving well-being and addressing issues related to ABS, anxiety, and depression in this vulnerable population.

Limitation and recommendation

We acknowledge that the small sample size, primarily due to low student participation, is a limitation of this study. The paucity of similar studies in Mexico highlights the urgency for more comprehensive research on the impact of interventions on the mental health of university students. An increase in sample size is needed, as well as the inclusion of different public and private universities, along with the implementation of strategies to improve participation rates, which could strengthen the robustness of the results obtained. In addition, conducting longitudinal follow-up evaluations would provide information on the long-term effects of the intervention on participants' mental health outcomes, thus providing a more complete understanding of the effectiveness and sustainability of the intervention over time.

In addition, the complex structure of each student's academic schedule was a significant limitation that overlapped with the yoga interventions. In addition, lack of knowledge about yoga practice and its benefits was also a negative factor in participation. Therefore, we recommend that information about yoga and its benefits be disseminated to medical students.

Therefore, it is important to note that such interventions are both feasible and effective in reducing burnout among students population. As exemplified in other countries, university and hospital authorities in our country who are in contact with students in training should develop strategies to incorporate such activities into study programs, with or without curricular benefits, to encourage active participation, with the primary goal of improving students' well-being and mental health.

Conclusion

This study demonstrates the feasibility and effectiveness of a yoga-based intervention to reduce burnout among medical students. These findings are consistent with broader public health goals of promoting student well-being and fostering healthy academic environments. Future research should examine the cost-effectiveness of yoga programs compared to other interventions for burnout prevention in medical education. In addition, examining the long-term effects of yoga on student well-being and academic outcomes would further strengthen the rationale for integrating yoga into medical school curricula.

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Conflicts of interest

There are no conflicts of interest.

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