Influencing Factors and Prevalence of Anxiety in Medical Students: A Cross-Sectional Study

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ARTICLE INFO	ABSTRACT
	Introduction: While current research highlights student anxiety globally, limited data exists on the specific situation of Vietnamese medical students. This study addresses this gap by investigating the prevalence and contributing factors of anxiety within this population, aiming to gain a deeper understanding of their mental health experiences. **Methods:** Utilizing a convenience sampling technique, 400 medical students from Ho Chi Minh City University of Medicine & Pharmacy were surveyed using the Zung Self-Rating Anxiety Scale and a custom questionnaire assessing factors contributing to anxiety. Data analysis included descriptive statistics, independent-samples t-tests, ANOVA, and Pearson's correlation. **Results:** Findings revealed mild to moderate anxiety levels among medical students (M = 49.68 ± 11.54), with significant differences based on gender, academic year, and academic performance. Males (M = 51.27 ± 12.26) and senior students (M = 53.18 ± 12.50) reported higher anxiety levels. Key contributors to anxiety included financial concerns, major examinations, and discrepancies between perceived and desired academic performance. Notably, a strong positive correlation was found between academic performance discrepancies and anxiety levels (r = 0.888, p < 0.001). **Conclusion:** The study highlights a potentially higher prevalence of anxiety among medical students than previously reported, emphasizing the need for targeted interventions. Understanding the multifaceted nature of anxiety and its contributing factors is crucial for fostering a supportive learning environment, ultimately nurturing well-equipped and resilient healthcare professionals.

INTRODUCTION

Medical education's rigor and demanding nature place significant stress on students, who face the future responsibility of patient care, complex decision-making, and long hours. Their mental well-being is paramount, as neglecting it can affect their personal lives, professional competence, and patient outcomes (1). Research consistently reveals elevated anxiety, depression, and burnout rates among medical students, fueled by workload, sleep deprivation, and exposure to human suffering (2). These challenges, when left unaddressed, can impair

cognitive function, memory consolidation, and concentration, impacting academic performance and clinical skills development (3). Moreover, emotional exhaustion and burnout can hinder their ability to connect with patients, potentially compromising the quality of care and hindering the development of crucial empathy and patient-centeredness (1, 2). Despite growing awareness, stigma surrounding mental health persists, discouraging students from seeking help due to fear of judgment, confidentiality concerns, or academic repercussions.

Anxiety, characterized by excessive worry and fear, significantly impacts individuals' mental and physical well-being. It not only precedes various mental health disorders, but also contributes to academic difficulties, burnout, and depression. Heightened neural reactivity in individuals with anxiety leads to cognitive, emotional, and physical symptoms that can impair functioning (4). Students with high anxiety often struggle with concentration, memory, and engagement, hindering their academic performance (5). Additionally, chronic anxiety can lead to burnout, further reducing productivity and increasing the risk of depression, creating a detrimental cycle (6).

The prevalence of anxiety among medical students poses a significant concern, with studies consistently showing higher rates compared to the general population. This is linked to the rigors of medical education, including long study hours, high-stakes exams, and the emotional weight of patient care. A systematic review by Tian-Ci Quek, Wai-San Tam (7) found a global prevalence of anxiety among medical students as high as 33.8%, though variation across countries highlights the importance of cultural and educational factors. Puthran, Zhang (8) confirmed this disparity, showing medical students experience significantly higher anxiety than their peers in other degree programs, pinpointing academic pressures, financial concerns, and fear of clinical mistakes as major contributors. These findings align with Dyrbye, Thomas (9), who identified intense academic workload and pressure to excel as primary drivers of anxiety, creating a potential pathway to burnout and depression if left unaddressed.

Research on anxiety among Vietnamese medical students highlights significant concerns about mental health within medical education, mirroring a broader global trend. Studies in Vietnam show that medical students experience high levels of anxiety, comparable to or even exceeding rates seen internationally. For example, a study by Nguyen, Do (10) found that over 60% of Vietnamese medical students reported moderate to severe anxiety. This is attributed to factors like academic pressure, an intensely competitive environment, and worries about future employment and clinical competence. These findings emphasize the need to address mental health challenges faced by medical students in Vietnam and around the world.

While previous research during the COVID-19 pandemic highlighted elevated anxiety levels among medical students, a lack of studies in diverse contexts and the post-COVID-19 landscape limits our understanding. Our study aims to bridge this gap by investigating two key questions: (1) the current state of anxiety in medical students, and (2) the specific factors that influence or cause anxiety from the student perspective. This research will provide valuable insights into the mental health challenges faced by medical students and help inform targeted interventions.

METHOD
Participants

This study utilized a convenience sampling technique to identify and recruit student participants at Ho Chi Minh City University of Medicine & Pharmacy. A calculation formula for sample size suggested by Daniel (11), n = z2p (1-p)/e2, was used to determine the sample size with 95% confidence (z = 1.96), a margin of error of 5% (e = 0.05), and a population proportion of 0.5 (p = 0.5). After calculation, n must be at least 384 for the sample size. A total of 400 medical students volunteered and completed the questionnaire. Following a screening process, 400 responses were deemed valid and included as research samples. The sample comprised 56.3% males (n = 225) and 43.7% females (n = 175). Among the participants, 45.5% were sophomores (n = 182), 17.0% juniors (n = 68), and 37.5% seniors (n = 150). Additionally, 33.0% (n = 132) reported having a part-time job, while 67.0% (n = 268) did not. The participants displayed a range of academic performance, with 7.0% (n = 28) categorized as A-students, 45.0% (n = 180) as B-students, 33.5% (n = 134) as C-students, 12.3% (n = 49) as D-students, and 2.3% (n = 9) as F-students. Table 1 presents detailed social demographic information of participants.

Ethical aspects

The study adhered to the ethical guidelines of the Declaration of Helsinki (12) and the American Psychological Association's principles for human research (13), ensuring respect for participant rights, well-being, and privacy. All participants provided informed consent prior to their involvement in the study.

Measurement

The Zung Self-Rating Anxiety Scale (SAS), developed by Zung (14) in 1971, was used in this study. The SAS is a 20-item self-administered instrument designed to measure an individual's anxiety levels. Participants respond to statements indicating the frequency (how often) each statement applies to them within the past one to two weeks. A Likert-type scale of 1 to 4 was used (1 = "a little of the time," 2 = "some of the time," 3 = "good part of the time," 4 = "most of the time"). To minimize response bias, some statements are worded negatively. The Vietnamese version of Zung SAS was adapted by Tran, Tran (15) and showed very good internal reliability with Cronbach's α = 0.80, 95% CI [0.77, 0.83] (16). The total raw score was obtained by summing the individual item scores, ranging from 20 to 80. Items 5, 9, 13, 17, and 19 were reverse recode. The Anxiety Index score is interpreted based on the following clinical scale (17): 1) 20–44: Normal Range, 2) 45–59: Mild to Moderate Anxiety Levels, 3) 60–74: Marked to Severe Anxiety Levels, 4) 75 and above: Extreme Anxiety Levels

This study also involved the development of a measurement scale specifically designed to assess factors contributing to anxiety in medical students. The scale comprises 10 items, each representing a distinct factor that can influence the anxiety levels of medical students. Participants responded to these items using a 4-point Likert scale (1 = No impact, 2 = little impact, 3 = Moderate impact, 4 = Significant impact), indicating the extent to which each factor affects their anxiety levels.

Analyses

Malhotra, Nunan (18) posit that both the origin (zero point) and units of a scale are arbitrary. Consequently, any positive linear transformation ($y = a + bx$) preserves the scale's properties. In this equation, "y" represents the transformed value, "x" denotes the original value, and "a" and "b" are constants (omitted in the transformation). Given the arbitrary nature of scales, extending coding for responses to dimensional items during data analysis becomes crucial. This study employed typical scales ranging from 1 = a little of the time / no impact to 4 = most of the time / significant impact. The extension of this scale is calculated as the difference between the highest and lowest values (4 – 1 = 3). To determine the unit length of the transformed scale, the value of "b" is calculated as b = 3/4 = 0.75. This value reflects the increment between adjacent transformed values. The upper limit for each category is then determined using the equation "$y = a + bx$," where "a = 1" (representing the constant difference between adjacent original values) and "b = 0.75." Applying this equation to different values of "x" (1, 2, 3, and 4) yields the following transformed ranges and their corresponding interpretations: 1) 1.00–1.75 = A little of the time / No impact, 2) 1.76–2.50 = some of the time / little impact, 3) 2.51–3.25 = Good part of the time / Moderate impact, 4) 3.26–4.00 = Most of the time / Significant impact

Following data collection, the dataset was encoded and cleaned using Microsoft Excel software to eliminate error variables. Subsequently, the entire dataset was imported into IBM SPSS Statistics version 24 for statistical analysis. Descriptive statistics were employed to summarize the data, while inferential statistics were performed through independent-samples t-tests and one-way analysis of variance (ANOVA) with post-hoc Tukey's HSD test for pairwise comparisons. Pearson's correlation analysis was applied to investigate the relationships between anxiety levels and the factors contributing to anxiety, as perceived by medical students.

RESULTS

The medical students' average anxiety score was M = 49.68 (SD = 11.54), placing the sample within the mild to moderate anxiety range. Descriptive analysis revealed that 49.50% (n = 198) of the medical students exhibited normal range anxiety levels, followed by 32.75% (n = 131) with mild to moderate anxiety levels, 13.25% (n = 53) with marked to severe anxiety levels, and 4.50% (n = 18) with extreme anxiety levels.
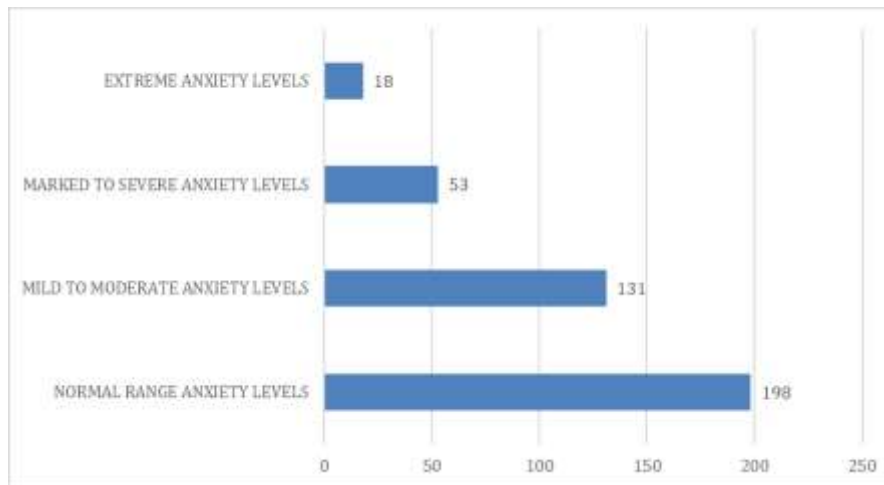
Figure 1. Number of participants by anxiety levels.

The results of the independent samples T-test indicated that males (M = 51.27, SD = 12.26) exhibited significantly higher anxiety scores compared to females (M = 47.62, SD = 10.21). However, no significant difference was found in anxiety scores between students with (M = 49.43, SD = 11.23) and without (M = 49.79, SD = 11.71) part-time jobs. Moreover, the one-way ANOVA, followed by post hoc Tukey's HSD test, demonstrated that senior students (M = 53.18, SD = 12.50) displayed significantly higher anxiety scores than sophomores (M = 47.35, SD = 10.96) and juniors (M = 48.17, SD = 9.60). No significant differences were observed between sophomore and junior students. Additionally, A-students (M = 59.00, SD = 15.70) reported significantly higher anxiety scores compared to all other student groups. However, no significant differences were identified among B-students (M = 49.28, SD = 11.53), C-students (M = 48.55, SD = 10.11), D-students (M = 49.59, SD = 10.78), and F-students (M = 45.66, SD = 9.47).

Table 1. Social demographic of participants and comparison tests (Zung SAS).

	n (%)	M	SD	p
Gender[a]				p < 0.01
Male	225 (56.3)	51.27	12.26	
Female	175 (43.7)	47.62	10.21	
Academic year[b]				$p_{1-3} < 0.001$ $p_{2-3} < 0.01$
Sophomore[1]	182 (45.5)	47.35	10.96	
Junior[2]	68 (17.0)	48.17	9.60	
Senior[3]	150 (37.5)	53.18	12.50	
Part-time job[a]				p > 0.05
Yes	132 (33.0)	49.43	11.23	
No	268 (67.0)	49.79	11.71	
Academic GPA[b]				$p_{2,3-1} < 0.001$ $p_{1-4} < 0.01$

				$p_{1-5} < 0.05$
A (8.5 – 10)[1]	28 (7.0)	59.00	15.70	
B (7.0 – 8.4)[2]	180 (45.0)	49.28	11.53	
C (5.5 – 6.9)[3]	134 (33.5)	48.55	10.11	
D (4.0 – 5.4)[4]	49 (12.3)	49.59	10.78	
F (below 4.0)[5]	9 (2.3)	45.66	9.47	

Notes: a. Independent Samples T-Test; b. One-Way ANOVA Post Hoc Tukey's HSD Tests.

Table 2 presents a detailed breakdown of factors potentially impacting medical student anxiety levels. The factors with the highest mean scores, indicating a greater perceived impact on anxiety, were financial concerns (M = 3.16, SD = 1.01), impending major examination (M = 2.53, SD = 0.77), and academic performance discrepancies (M = 2.48, SD = 0.84). Conversely, the factors with the lowest mean scores, suggesting a lesser perceived impact on anxiety, were uncertain career path (M = 1.54, SD = 0.59), fear of misalignment between education and profession (M = 1.67, SD = 0.70), and night shift duties (M = 1.75, SD = 0.86).

Table 2. Factors affecting medical student anxiety.

Factors	M	SD
Impending major examination	2.53	0.77
Academic performance discrepancies	2.48	0.84
Multifaceted course load	1.95	0.77
Uncertain career path	1.54	0.59
Fear of misalignment between education and profession	1.67	0.70
Night shift duties	1.75	0.86
Risk of nosocomial infections	2.12	0.95
Financial concerns	3.16	1.01
Peer/friend relationships	2.02	1.04
Family relationships	1.91	0.90

Notes: M: Mean, SD: Standard Deviation.

Pearson's correlation analysis revealed a very strong positive association (r = 0.888, p < 0.001) between academic performance discrepancies and anxiety levels. This indicates that students who experience larger discrepancies between their desired and actual academic performance tend to report significantly higher levels of anxiety. Additionally, a weak negative association (r = -0.262, p < 0.05) was observed between night shift duties and anxiety level. This suggests that there might be a slight tendency for students with night shift duties to report lower anxiety levels (19).

Table 3. Correlation between anxiety level and factors affecting.

Factors	r	p
Impending major examination	0.098	p = 0.05
Academic performance discrepancies	0.888	p < 0.001
Multifaceted course load	-0.084	p > 0.05
Uncertain career path	0.083	p > 0.05
Fear of misalignment between education and profession	0.0216	p > 0.05
Night shift duties	-0.262	p < 0.05
Risk of nosocomial infections	0.373	p > 0.05
Financial concerns	-0.017	p > 0.05

| Peer/friend relationships | -0.026 | p > 0.05 |
| Family relationships | 0.065 | p > 0.05 |

Notes: r: Pearson's correlation; p: p-value.

DISCUSSION

This study investigated anxiety levels and factors affecting medical students. The average student score indicated mild to moderate anxiety, with a significant difference between genders and year of study. Males and senior students reported higher anxiety than females and younger students, respectively. Notably, students with top academic grades (A-students) displayed the highest anxiety. Financial concerns, impending major exams, and academic performance discrepancies were identified as the most significant contributors to anxiety, while uncertain career paths, fear of professional misalignment, and night shifts had the least impact. Interestingly, a strong positive correlation was found between academic performance discrepancies and anxiety, while a weak negative association existed between night shifts and anxiety.

The finding is that the average medical student in this study scored within the mild to moderate anxiety range (M = 49.68, SD = 11.54). This study also found that around 50% of medical students experienced anxiety, which is higher than the reported prevalence in other studies, 24.66% to 35.54% in Ethiopia (20), 29.2% to 38.7% globally (7). These findings suggest that anxiety might be a more prevalent concern among medical students in this specific setting compared to other populations. This elevated state of anxiety can be attributed to various factors, including the demanding nature of medical education, the high-pressure environment, and the stress associated with academic performance and future careers. It is crucial to acknowledge that anxiety, within a certain range, can be a positive motivator, pushing students to excel academically (21). However, excessive and persistent anxiety can have a detrimental impact on students' well-being, academic performance, and mental health.

This study found that male medical students reported higher anxiety scores than females (M = 51.27 vs. M = 47.62), contradicting previous studies suggesting higher female anxiety levels (7, 20) or no significant gender difference (22, 23). This discrepancy could be influenced by factors like cultural expectations surrounding masculinity, which might discourage male students from expressing anxiety or seeking support. Even amid high educational achievement, gender norms still significantly impact men's health-seeking behaviors (24). These findings highlight the complex relationship between gender and anxiety in medical students, calling for further research to delve into these potential influences.

This study identified a potential link between year of study and anxiety, with seniors (M = 53.18) reporting significantly higher scores than sophomores (M = 47.35) and juniors (M = 48.17). This aligns with past research suggesting increased anxiety in later years due to factors like rising clinical responsibilities, unfamiliar settings, and potential for errors (25, 26). Additionally, senior students often encounter sensitive experiences like patient deaths and challenging interactions, further contributing to anxiety (7). However, inconsistencies in existing literature highlight the need for further exploration. For instance, Kebede, Anbessie (20) found a link with anxiety in second-year students, while Liu, Zhu (22) observed no difference across year levels. These discrepancies suggest the complex relationship between year of study and anxiety may be influenced by variations in stressors and experiences across institutions and cultures.

This study found that A-students reported the highest anxiety scores (M = 59.00, SD = 15.70), contradicting some research suggesting a negative correlation between anxiety and academic performance (27). This discrepancy could be explained by a distinct type of anxiety experienced by high-achieving medical students—a fear of failure or underperformance despite their good grades (28). This differs from debilitating anxiety that significantly hinders academic performance, as observed in other studies. It highlights the nuanced relationship between anxiety and academic success, suggesting that even top students may struggle with intense pressure and fear of not meeting their own exceptionally high standards.

This study identified financial concerns, impending major examinations, and academic performance discrepancies as the factors with the highest perceived impact on anxiety among medical students (M = 3.16, M = 2.53, M = 2.48, respectively). This study also identified uncertain career path, fear of misalignment between education and profession, and night shift duties as factors with the lowest mean scores regarding perceived impact

on anxiety among medical students with M = 1.54, M = 1.67, M = 1.75, respectively. These findings highlight the multifaceted nature of anxiety and the various stressors contributing to their well-being based on the medical student perspective. While this study identified only a link between academic performance discrepancies and anxiety levels (r = 0.888, p < 0.001), suggesting higher anxiety in students falling short of their academic goals, other correlations were less clear. The very strong positive association between performance discrepancies and anxiety highlights the potential psychological burden of feeling behind academically. This emphasizes the importance of addressing student concerns and providing support to promote well-being. It's important to note that the other observed correlation, a weak negative association between night shift duties and anxiety levels (r = -0.262, p < 0.05), is much weaker. While suggesting a potential trend of slightly lower anxiety in students with more night shifts, the weakness of this association makes drawing definitive conclusions difficult. Further research is needed to explore this potential link and clarify its significance.

Implications for Public Health

This study's finding of higher anxiety in males contrasts with the inconsistent picture painted by existing literature. This highlights the need for further research to understand how gender, cultural expectations, and help-seeking behaviors interact within medical student populations. Additionally, the potential link between increased anxiety and later years of study suggests a need for tailored interventions that address the specific challenges students face at different stages of their education. The finding that even high-achieving "A" students experience significant anxiety challenges the assumption that academic success equates to lower anxiety (29). This emphasizes the importance of addressing perfectionism and anxiety in all students to promote well-being and prevent burnout. Finally, identifying financial concerns, academic performance discrepancies, and impending examinations as major sources of anxiety provides valuable direction for targeted interventions that address these specific stressors.

This study's findings call for multi-pronged public health interventions to address medical student anxiety. Implementing mental health screening and support services within schools can lead to early identification and assistance. Providing students with coping mechanisms and stress management skills through workshops and training programs empowers them to manage their well-being (30). Additionally, promoting open communication and addressing cultural stigmas surrounding mental health is crucial for creating a supportive environment where students feel comfortable seeking help. Furthermore, addressing specific stressors through financial aid and academic support services can alleviate anxieties related to finances and performance. Finally, continuous research on influencing factors and development of effective interventions are essential for ongoing improvement in supporting medical student well-being throughout their academic and professional journey (31).

Limitations and Recommendations for Future Research

While this cross-sectional study offers valuable insights into medical student anxiety, its limitations deserve consideration. Firstly, the correlational design establishes associations with anxiety, not causation, meaning we cannot definitively say one factor causes another. Secondly, relying on self-reported data introduces potential response bias due to students' subjective experiences and potential biases. Lastly, the study design might not capture all confounding variables that could influence both anxiety and the investigated factors, making it difficult to isolate the true effect of specific factors. Recognizing these limitations, future research with more robust methodologies is necessary to draw definitive conclusions and develop effective interventions to support medical student well-being.

CONCLUSION

This study investigated the multifaceted nature of anxiety among medical students, revealing a high prevalence (around 50% reported mild to moderate anxiety) and the complex interplay of contributing factors. Interestingly, gender and year of study significantly influenced anxiety levels, with male students and those in senior years reporting higher scores. These findings challenge traditional assumptions and underscore the importance of sociodemographic variables in mental health. Furthermore, a positive correlation between academic performance discrepancies and anxiety levels highlights the psychological impact of academic pressures. Notably, night shifts

displayed a minimal association with anxiety, suggesting a need for further exploration in this area. While limitations inherent to the cross-sectional design restrict the establishment of causal relationships, this study provides valuable foundational insights. Future research employing longitudinal methodologies can explore the causal pathways and long-term impact of anxiety on medical students' academic and professional trajectories. This research offers valuable information for educators, policymakers, and mental health professionals invested in supporting the well-being of the future generation of healthcare providers.

AUTHOR'S CONTRIBUTION STATEMENT

Conceptualization: HTN, YTHP, AVNH, TBN, GPTT; Methodology: HTN, YTHP, AVNH, TBN, GPTT; Data collection: HTN, YTHP, AVNH, TBN, GPTT; Formal analysis: HTN, YTHP, AVNH, TBN, GPTT; Writing - original draft: HTN, AVNH, GPTT; Writing - review & editing: HTN, YTHP, AVNH. All authors have read and agreed to the published version of the manuscript.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest related to this publication.

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