

## Prevalence of depression, anxiety, and academic stress among medical students during different periods of stress

### *Prevalencia de depresión, ansiedad y estrés académico entre estudiantes de medicina, durante distintos periodos de estrés*

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#### **Summary**

**Objective:** To determine the prevalence and severity of anxiety, depression and academic stress, as well as to evaluate the variation between a high stress level period (HSP) and a low stress level period (LSP). **Methods:** A longitudinal descriptive study was performed, using the Beck's anxiety-depression inventories and academic stress, during a period of examinations and another free of evaluation in medicine students at the Universidad Veracruzana. **Results:** A prevalence of 75.4% of anxiety symptoms was observed in the HSP, decreasing 10.8% in LSP. There were 41% depressive symptoms in the HSP, decreasing 30.6% in LSP. Academic stress was observed in 70% in the HSP, decreasing 19.5% in LSP, in both periods, the main stressors were exams, academic overload, lack of time and expositions. **Conclusion:** There is a significant decrease between the HSP and LSP, however, in the latter high levels of anxiety, depression and academic stress prevail.

**Keywords:** Anxiety; Depression; Academic Stress; University Students

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## Resumen

**Objetivo:** determinar la prevalencia y severidad de ansiedad, depresión y estrés académico; evaluar la variación entre un periodo con alto (PAE) y bajo nivel de estrés (PBE). **Métodos:** Se realizó un estudio descriptivo longitudinal, utilizando los inventarios de Ansiedad-Depresión de Beck y estrés académico, durante un periodo de exámenes y otro libre de evaluación en estudiantes de medicina de la Universidad Veracruzana. **Resultados:** En el PAE la sintomatología de ansiedad fue de 75.4% y se redujo 10.8% en el pbe. Se registró 41% de síntomas depresivos (PAE), reduciendo 30.6% (PBE). El estrés académico se observó en 70% (PAE), disminuyendo 19.5% (PBE), en ambos periodos los exámenes, la sobrecarga académica, falta de tiempo y exponer fueron los principales estresores. **Conclusión:** Existe una disminución significativa entre el PAE y el PBE, sin embargo, en este último siguen prevalentes altos niveles de síntomas de ansiedad, depresión y estrés académico.

**Palabras clave:** ansiedad, depresión, estrés académico, estudiantes universitarios

## Introduction

Anxiety and depression have been seen as common problems among medical students,<sup>1-3</sup> attributed to a high academic demand, long and discontinuous schedules that predispose to poor sleep and eating habits, among other factors that could lead to the development these psychopathologies.<sup>4-6</sup>

Anxiety can be understood as a regular and normal response in everyday situations that serves as a warning signal regarding an imminent danger.<sup>7</sup> However, sometimes it surpasses the adaptive

capacity of the individual and becomes abnormal and/or pathological, manifesting itself in physical, psychological and behavioral changes.<sup>8</sup> The reported global prevalence of anxiety disorders is 7.3% and a greater frequency between 25 and 45 years old, being more common in women.<sup>9</sup> Reported prevalence among Latin American medical students oscillates between 35 and 82%.<sup>10-13</sup>

Experiencing stress and/or anxiety for prolonged periods leads to exhaustion and is possibly association with depression.<sup>14</sup> Nowadays, depression is a worldwide public health problem, being the fourth cause of disability in terms of loss of healthy life years, estimated to affect 350 million people worldwide.<sup>15</sup> In Latin America and the Caribbean, depression is the most common mental disorder and is estimated to affect 5% of the general population.<sup>16</sup> The prevalence of depressive symptomatology in Latin American medical universities is around 35%.<sup>10,11</sup>

Added to this, university students commonly report elevated time demands from academic activities and events, which in turn cause different internal conflicts that, when students are unable to handle them properly, become a source of stress, referred to as academic stress.<sup>3,17,18</sup> The prevalence of academic stress is around 50% and its main risk factors are academic overload and lack of time to complete activities and exams.<sup>1,3,17</sup>

Few studies have evaluated these symptoms during different periods, showing a significant increase in levels of stress, anxiety and depression near or during the examination period.<sup>19-21</sup> Therefore, due to the high prevalence of these psychopathologies in medical students and the lack of studies evaluating different periods, the objective of this

study was to determine the prevalence and severity of symptoms, as well as to evaluate the pattern of changes during a period with high level of stress and the other with a low level.

## Methods

A descriptive longitudinal study was performed during the periods August 2017 to June 2018, on a representative sample of medical students at the Universidad Veracruzana, Minatitlán campus, including students enrolled from the first to the tenth semester. The study design was reviewed and approved by the Institutional Research and Ethics Committee (folio CIE 001-2019).

The students were asked to participate voluntarily to answer the survey. All participants had detailed knowledge of the purpose of the study and prior consent ensured the confidentiality of their responses. Students were asked to complete survey questionnaires during two different periods. In the first one, they answered the survey during an examination period (November-December 2017), assumed to be a high stress level period (HSP). In the second one, surveys were provided and answered at the beginning of the semester when students were free from examination (February-March 2018), which we assumed to be a low stress level period (LSP).

Three instruments were used: The Beck Anxiety Inventory (BAI),<sup>22,23</sup> the Beck Depression Inventory (BDI),<sup>22,24,25</sup> and the Academic Stress Inventory (ASI).<sup>3,26</sup>

The BAI consists of 21 items that are scored from 0 to 3 points. The final score consists of the sum of all items, leading to results that range from 0 to 63 points. We used the cut-offs suggested by Beck et al.,<sup>23</sup> as follows: 0-7 minimal anxiety,

8-15 mild anxiety, 16-25 moderate anxiety and 26-63 severe anxiety.

The BDI consists of 21 self-rated items scored from 0 to 3. As with the BAI, the final score for the BDI consists of the sum of all items, leading to results that range from 0 to 63 points. We used the cut-off suggested by Beck et al.,<sup>25</sup> as follows: 1-10 highs and lows (considered normal), 11-16 mild mood disturbance, 17-20 intermittent depression, 21-30 moderate depression, 31-40 major depression, and more than 40 extreme depression.

The ASI consists of 11 items that organize the main stressors according to the perception of the students. Each item is scored from 1 to 3 according to how much stress each activity is perceived to cause, with higher scores indicating higher levels of stress. The final score results from the sum of all items, leading to totals that range from 12 to 25 points. We used the cut-offs suggested by Speilberger et al.,<sup>26</sup> as

follows: high: over 25 points, medium: 18-24, low: 12-17.

### Statistical analysis

Participants who did not complete the survey questionnaires in both periods were excluded from statistical analysis. For the descriptive data, frequencies and percentages were calculated. The comparison between the periods was obtained by calculating the percentage of change that represents the amount of variation with respect to the value obtained in the first period (HSP), compared with the value obtained in the second period (LSP) using division (HSP/LSP), and then multiplied by 100. For the statistical analysis between periods and the estimates of the relationship between sex, age and semesters, the chi-square test, Wilcoxon and the Kruskal-Wallis test were used. The chosen level of statistical significance was  $p < 0.05$ . Statistical analyses were performed using GraphPad Prism 5. 0 and spss v. 21, both versions for MacOS.

### Results

Of a total of 311 students enrolled, only 183 (58.8%) replied in both periods. 114 (62.3%) were women and 69 (37.7%) were men, with an average age of 20.4 years (range 18-26 years). The semesters were distributed as follows: 66 (36.1%) in the first semester, 41 (22.4%) in the third, 28 (15.3%) in the fifth, 25 (13.7%) in the seventh, and 23 (12.6%) in the ninth.

### Anxiety

During the HSP, the prevalence of anxiety symptoms 75.4% in the population, while in the LSP it was 67.2%, recording a decrease of 10.8% between both periods ( $p < 0.0007$ ), reflected as follows: mild anxiety increased 1.1 percentage points, while there was a 2.2 and 7.1 percentage points decrease in the prevalence of moderate and severe anxiety, respectively, see table 1.

No significant difference was observed when comparing the symptoms of

**Table 1. Anxiety symptomatology prevalence in medical students in relation to the total sample, semester, sex and ages**

	HSP										
	Total	Semester					Sex		Ages		
	n=183	9º n=23	7º n=25	5º n=28	3º n=41	1º n=66	F n=114	M n=49	18-20 n=100	21-23 n=77	>24 n=6
Total	75.4	65.2	92.0	71.4	70.7	77.3	75.4	75.3	76	74.2	66.6
Mild	26.2	8.7	28.0	32.1	34.1	24.2	22.8	31.8	27	27.2	-
Moderate	29	34.8	40.0	28.6	17.1	30.3	35.1	18.8	30	26	50
Severe	20.2	21.7	24.0	10.7	19.5	22.7	17.5	24.6	19	21	16.6
	LSP										
Total	67.2 †*	73.7	72 †*	53.5	73.2 †*	63.6 †*	68.4 †*	65.2 †*	70 †*	66.3 †*	66.6
Mild	27.3	26	44	21.4	31.7	21.2	27.1	10.1	33	22.1	-
Moderate	26.8	43.4	12	25	17.1	31.8	25.3	27.5	23	28.5	66.6
Severe	13.1	4.3	16	7.1	24.4	10.6	14.9	27.5	14	13	-

High stress level period (PHS), low level of stress period (PLS)

Values expressed in percentage, † differences between periods

\* $p < 0.05$

inter-semesters anxiety in both periods. However, significant differences were observed when comparing between semesters of the HSP and the LSP; the first and second semesters ( $p=0.003$ ), the third and fourth ( $p=0.001$ ) and the seventh and eighth ( $p=0.016$ ).

When analyzing the age, a 76% prevalence of anxiety symptoms was observed in the HSP in students aged 18-20 years, similar to those aged 21-23 years (74.2%) and over 24 years (66%), while in the LSP, a decrease of 8% was observed in students aged 18-20 years, 15.5% in those aged 21-23 years and no change in those aged over 24 years. No significant difference was observed when comparing age groups in each one of the periods. However, significant differences were observed in most age groups when comparing the prevalence of anxiety bet-

ween the HSP and the LSP (18-20 years,  $p=0.003$  and 21-23 years,  $p=0.035$ ).

### Depression

In the HSP, the prevalence of depressive symptomatology was 41% (18% showed mild mood disturbance, 9.8% states of intermittent and moderate depression respectively and 3.3% major depression), while in the LSP it was 28.4%, with a 30.6% decrease ( $p<0.0001$ ), in which there was a 15.1% decrease in mild mood disturbance, 27.7% in intermittent states of depression, 55.5% in moderate depression, 66.6% in major depression, and a 100% increase in extreme depression, see table 2.

The distribution by semester shows in HSP the highest prevalence of depressive symptomatology in first and seventh semester students, both with 48%; the

semester with the lowest prevalence was the third semester with 31.7%; while in the LSP the highest prevalence was registered in the fourth semester with 36.5%, followed by the ninth semester with 31.8% and the lowest prevalence in the sixth semester with 17.8% (see table 2). No significant differences in inter-semester depressive symptomatology were found in any of the periods, however, significant differences were recorded when comparing the HSP and the LSP ( $p<0.0001$ , respectively for all semesters).

In relation to the sex, in the HSP 42.1% of women and 39.1% of men had depressive symptomatology, while the LSP recorded a 30% decrease in the prevalence of symptomatology in women ( $p<0.00001$ ) and 27.5% in men ( $p<0.00001$ ) (see table 2). No significant

**Table 2. Depression symptomatology prevalence in medical students in relation to the total sample, semester, sex and ages**

	HSP										
	Total	Semester					Sex		Ages		
	n=183	9 <sup>o</sup> n=23	7 <sup>o</sup> n=25	5 <sup>o</sup> n=28	3 <sup>o</sup> n=41	1 <sup>o</sup> n=66	F n=114	M n=49	18-20 n=100	21-23 n=77	>24 n=6
Total	41	39	48	32.2	31.8	48.3	42.1	39.1	35	49.3	33.2
MMD	18	8.7	32	14.3	9.8	22.7	17.5	18.1	14	24.6	-
ID	9.8	13	4	3.6	7.3	15.1	11.4	7	7	14.2	-
MD	9.8	13	12	14.3	9.8	6	10.5	8.7	11	7.8	16.6
SD	3.3	4.3	-	-	4.9	4.5	2.6	4.3	3	2.5	16.6
ED	-	-	-	-	-	-	-	-	-	-	-
	LSP										
Total	28.4 †*	31.7 †*	26.8 †*	17.9 †*	36.5 †*	27.1 †*	29 †*	27.5 †*	29 †*	27.2 †*	16.6 †
MMD	15.3	18.1	19.2	7.14	19.1	13.6	14	17.3	17	14.2	-
ID	7.1	9.1	7.7	10.8	4.9	6	9.6	2.8	8	5.2	-
MD	4.4	-	-	-	7.3	7.5	4.3	4.3	1	7.8	16.6
SD	1.1	4.5	-	-	2.4	-	0.8	1.4	2	-	-
ED	0.5	-	-	-	2.4	-	-	1.4	1	-	-

High stress level period (PHS), low level of stress period (PLS), Mild mood disturbance (MMD), intermittent depression states (ID), moderate depression (MD), severe depression (SD), extreme depression (ED)

Values expressed in percentage, † differences between periods

\* $p<0.05$

differences were observed when comparing the sexes in both periods.

According to the age, in the HSP, 49.3% of students aged 21-23 showed depressive symptoms, followed by 35% of those aged 18-20 and 16.6% of those aged 24 and older, while in the LSP there was a 45% decrease in the prevalence in students aged 21-23, followed by 17% of those aged 18-20, and 50% of those aged 24 and older (see table 2). Significant differences were observed when comparing ages between HSP and LSP (18-20 years,  $p < 0.0001$ ; 21-23 years,  $p < 0.0001$ ; older

than 24 years,  $p = 0.0313$ ), but not between age groups in each of the periods.

### Academic Stress

In the HSP it was observed that around 70% of students present academic stress (20.2% showed high level and 49.7% medium), with the main academic stressors being taking exams (88.5%), academic overload (87.4%), lack of time (86.9%) and expositions (86.3%), on the other hand, the least relevant were overcrowding of classrooms (63.4%) and working in groups (60.7%). While

in the LSP a 19.5% decrease in the prevalence of academic stress was observed ( $p < 0.0001$ , 13.6% showed high level and 42.6% medium), decreasing 43% in competitiveness, 16% academic overload, 13% the lack of time, 8% taking exams, but increased 2% the expositions (see table 3).

Regarding to semesters, in the hsp it was observed that 76% of seventh semester showed academic stress, followed by 73.9% of ninth semester and the lowest prevalence were of the third semester with 60.7%. The previous data

**Table 3. Stressing Academic factors prevalence in medical students in relation to the total sample, semester, sex and ages**

		n	HSP			LSP		
			Any stress symptoms	Medium	High	Any stress symptoms	Medium	High
Items	Take an exam	183	88.5	53.5	35	81.4	47	34.4
	Presentation	183	75.9	50.8	25.1	77.1	52.5	24.6
	Participation	183	49.8	36.1	13.7	49.2	35.5	13.7
	Academic overload	183	87.4	50.8	36.6	73.7 †*	39.3	34.4
	Classroom overpopulation	183	36.6	24.6	12	30.6 †*	23.5	7.1
	Lack of time	183	86.5	40.4	46.1	75.4 †*	39.9	35.5
	Other activities	183	44.3	33.9	10.4	39.9	29.5	10.4
	Competitiveness	183	54.1	34.4	19.7	36 †*	25.1	10.9
	School works	183	62.3	42.1	20.2	51.9 †*	39.3	12.6
	Study tasks	183	45.9	33.9	12	39.9 †*	33.3	6.6
Work in groups	183	39.4	25.7	13.7	29.5 †*	25.7	3.8	
Semester	1°	66	72.7	51.5	21.2	51.4 †*	45.4	6
	3°	41	65.8	53.6	12.2	60.9 †*	34.1	26.8
	5°	28	60.6	39.2	21.4	39.2 †* ¥*	35.7	3.5
	7°	25	76	48	28	64	48	16
	9°	23	73.8	52.1	21.7	73.8 ¥*	52.1	21.7
Sex	Female	114	71.9	45.6	26.3	62.2% †*	47.3	14.9
	Male	49	66.6	56.5	10.1	46.6 †*	34.7	11.5
Ages	18-20	100	70	51	19	58	41	17
	21-23	77	71.5	52	19.5	54.5	46.7	7.8
	>24	6	49.9	16.6	33.3	49.9	33.3	16.6

High stress level period (PHS), low level of stress period (PLS)

Values expressed in percentage, † differences between periods, ¥ intra-group differences

\* $p < 0.05$ .

do not show differences when they are compared with each other. While in the LSP, tenth semester students showed a higher prevalence of academic stress with 77.2%, followed by 61.5% in the eighth semester and finally in the sixth semester showed a lower prevalence with 39.2% (Table 3). In the LSP significant differences were observed when comparing the semesters ( $p=0.0402$ ; Dunn's test= tenth and sixth), in the same way differences were observed when comparing the HSP and the LSP, first with second semester ( $p<0.0001$ ); third with fourth ( $p<0.0001$ ) and fifth with sixth ( $p=0.0098$ ).

According to the sex, 71.9% of women and 66.6% of men presented academic stress in the HSP, showing significant differences between sexes ( $p=0.030$ ). While in the LSP, the prevalence decreased 15% in women ( $p=0.0013$ ) and 30% in men ( $p=0.0151$ ) (see table 3). No significant differences were found when comparing sex between HSP and LSP.

Regarding the ages, in the HSP it was observed that 70, 71.4 and 50% of students between 18-20, 21-23 and older than 24 years respectively showed academic stress. While in the LSP it was registered a decrease in prevalence of 17% in students aged 18-20, 24% in those aged 21-23, and no change in those older than 24 years (see table 3). Significant differences were observed when comparing depressive symptomatology and ages between HSP and LSP (18-20 years,  $p<0.0009$ ; 21-23 years,  $p<0.0224$ ), but it was not recorded when comparing age groups in each of the periods.

Finally, in both HSP and the LSP, academic stress was associated with both anxiety ( $p<0.0005$ ) and depressive

symptoms ( $p<0.0005$ ). Anxiety and depressive symptoms were also associated with ( $p<0.0005$ ).

### Discussion

The results of this study show that medical students in this university have a high prevalence of symptoms of anxiety, depression and academic stress, both in the examination period and in the free evaluation period. These psychopathologies rise significantly when students are being evaluated. On the other hand, taking an exam, academic overload and lack of time are the main academic stressors among students at this institution.

The levels of anxiety in both periods studied are high and are similar to those reported in other countries.<sup>11</sup> On the other hand, they are higher than the reports of the general population at the national and international level, which range between 5-15%,<sup>9</sup> and those to the Latin American medical students, which range between 13-61.3%.<sup>3,10,12,13,27-29</sup> In this study a high number of students with severe anxiety was observed, being greater than the reports of other Latin American universities.<sup>10</sup> Differences in prevalence could be explained by the fact that some studies were carried out using different instruments, in addition to the fact that each country's culture and institutional demands are different.<sup>10</sup>

A high prevalence of depressive symptomatology was observed in both evaluated periods, similar to data from other universities.<sup>11</sup> On the other hand, this prevalence surpasses national,<sup>15,24</sup> and international reports between 19-34.6%.<sup>2,11,30,31</sup>

Relationship between semester and depression was observed, since the students of the first and seventh semesters

are those that presented greater prevalence, whose causes could be similar to that of anxiety.<sup>10</sup> This can be related to the adaptive and formative processes faced by students at that level of the career related to the symptoms of anxiety. In addition to factors such as the organization of time, lack of family support, migration from their places of origin, a low socio-economic level, among other characteristics that can contribute to the development of symptoms of stress and depression.<sup>7,32</sup>

The prevalence of academic stress in these students is high in both periods studied, coinciding with the data reported in Cuban medical students,<sup>33</sup> and surpassing others ranging from 50-65%.<sup>1,17</sup> Several studies show that stressors are constant, highlighting examinations, academic overload and lack of time, difficult schedules and fear of failure or poor performance.<sup>3,17,20,33</sup> Therefore, due to the high prevalence in both periods, it is advisable to continue with the study of internal and external factors that may promote or be associated with the increase of academic stress, as well as to design and implement strategies to lessen or counteract them, and to reduce their impact on students' school performance.<sup>16</sup>

Finally, several studies refer that symptoms of anxiety are associated with depression and academic stress among medical students.<sup>4,11,18</sup> Our study corroborates this association, and provides support to the idea of monitoring anxiety symptoms among medical students, since this symptomatology can generate an unwanted impact on the physical and mental health of students, which may negatively affect their performance in the classroom and in the clinic.<sup>3,19,24</sup>

## Conclusions

The medical students at Minatitlán campus have a high prevalence of anxiety, depression and academic stress symptoms, which decrease significantly but remain elevated during periods without examinations. These results should help to plan and develop more effective intervention and prevention programs and the implementation of a more balanced medical curricula. Measures should be proposed to carry out constant monitoring of mental health and the detection of external risk factors that influence medical students, since the career is one of the most demanding and competitive.

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