An assessment of mental health of Mexican and Colombian medical students during the COVID-19 pandemic

D. Xipe Pacheco-Tobón,[1] Edgar Bautista-Soto,[1] Claudia Arellano-Ramírez,[1] Daniela Orozco-García,[2] Lucia Ramos-Ruiz,[3] Eliana Herbales-Martinez,[3] Leonardo M. Porchia,[4] Ricardo Pérez-Fuentes,[1,4] M. Elba Gonzalez-Mejia[1]

[1] Facultad de Medicina, Benemérita Universidad Autónoma de Puebla, Puebla, México.

[2] Escuela de Medicina, Semillero Grupo GIBACUS, Universidad del Sinú seccional Cartagena, Campus Santillana, Cartagena, Colombia.

[3] Escuela de Medicina, Universidad Del Sinú. Campus Santillana, Cartagena, Colombia.

[4] Laboratorio de Fisiopatología en Enfermedades Crónicas, Centro de investigación Biomédica de Oriente, IMSS. Delegación Puebla. Atlixco, Puebla, México.

Correspondence:
C. M. Elba Gonzalez-Mejia
Facultad de Medicina, Benemérita Universidad Autónoma de Puebla.
13 Sur 2901
Colonia Volcanes,
C.P. 72420, Puebla, Puebla, México.
Phone: +52 222 524 4497; fax: +52 222 229 55 00 ext. 6043 or 6044

Email: elba.gonzalez@correo.buap.mx; elba.gonzalezmejia@gmail.com

ABSTRACT

Introduction. The COVID-19 pandemic caused the cessation of academic activities from the face-to-face format to confinement and virtual classes, in which little is studied about its effect on mental health. **Objective.** Determine levels of depression, anxiety, and stress in medical students in Mexico and Colombia during the COVID-19 pandemic. Furthermore, depression, anxiety, and stress were compared by gender, education status, and country. **Method.** A cross-sectional study was carried out with 426 medical students. Data was collected using an online survey containing the Depression, Anxiety, Stress Scale (DASS-21) questionnaire. **Results.** Overall scores for depression, anxiety, and stress were 6.7 ± 1.2, 8.8 ± 1.2, and 5.6 ± 1.2, respectively. Females had significantly higher overall scores for depression (.24-fold increase), anxiety (.25-fold increase), and stress (.40-fold increase) than males ($p \leq .01$). The risk for anxiety and stress by school year showed that basic years were associated with higher scores than advanced years (.25 and .38-fold increase, respectively). For females, starting medical school did show an increased risk of depression when compared to male students in their basic years (.38-fold increase). Lastly, students from Mexico had an increased risk for depression and anxiety ($p \leq .022$ and $p \leq .004$, respectively) but not for stress ($p \leq .402$), when compared to students from Colombia. **Discussion and conclusion.** Significant anxiety and depression were observed in medical students from Mexico and Colombia. Factors associated with an increased risk of depression and anxiety are students in their basic years as well as being female.

Keywords: COVID-19, México, Colombia, DASS-21, depression, anxiety, stress.

RESUMEN

Introducción. La pandemia de COVID-19 provocó el cese de las actividades académicas desde el formato presencial al confinamiento de las clases virtuales, de las que poco se ha estudiado sobre su efecto en la salud mental. **Objetivo.** Determinar los niveles de depresión, ansiedad y estrés en estudiantes de medicina de México y Colombia durante la pandemia de COVID-19; además de comparar depresión, ansiedad y estrés por género, nivel educativo y país. **Método.** Se realizó un estudio transversal con 426 estudiantes de medicina. Los datos se recopilaron mediante una encuesta en línea que contenía el cuestionario DASS-21. **Resultados.** Las puntuaciones generales de depresión, ansiedad y estrés fueron 6.7 ± 1.2, 8.8 ± 1.2 y 5.6 ± 1.2, respectivamente. Las mujeres tuvieron puntajes generales significativamente más altos para depresión (.24-fold increase), ansiedad (.25-fold increase) y estrés (.40-fold increase). El riesgo de ansiedad y estrés por año escolar mostró que los años básicos se asociaron con puntajes más altos que los estudiantes en años los avanzados (.25 y .38-fold increase). Para las mujeres, cursar años básicos mostró un mayor riesgo de depresión en comparación con los estudiantes varones (.38-fold increase). Por último, los estudiantes mexicanos tuvieron un mayor riesgo de depresión y ansiedad ($p \leq .022$ y $p \leq .004$, respectivamente) pero no de estrés ($p \leq .402$) en comparación con los estudiantes Colombianos. **Discusión y conclusión.** Se observó ansiedad y depresión significativas en estudiantes de medicina mexicanos y colombianos. Los factores asociados a un mayor riesgo de depresión y ansiedad fueron; ser estudiante en años básicos además de ser mujer.

Palabras clave: COVID-19, México, Colombia, DASS-21, depresión, ansiedad, estrés.

INTRODUCTION

Before the COVID-19 pandemic, in Mexico and Colombia, between 9 to 10% of the general population suffered from an affective disorder at some point in their lives (Berenzon, Lara, Robles, & Medina-Mora, 2013; Ministerio de Salud y Protección Social, 2017). In Mexico, it was shown that around 14% of the population presented with depression symptoms, affecting more women (Valencia, 2022), and 31% had some level of anxiety (INEGI, 2021). On the other hand, in Colombia, about 80% of the general population claimed to present with one to three symptoms of depression and 53% suffer from anxiety (Ministerio de Salud y Protección Social, 2017). Interestingly, as shown in Mexico, most mental disorders appear in individuals that are young adults, before the age of 21 (Berenzon et al., 2013; Martínez-Martínez, Muñoz-Zurita, Rojas-Valderrama, & Sánchez-Hernández, 2016), which is similar to Colombia, in which most present in women aged 18-44 years old, some of which attend university. This would suggest that university students are more prevalent to present with a mental disorder.

During university life, students are subjected to various stress-inducing factors that can threaten mental health, such as academic demands, excessive workload, personal life events, and the learning environment (Fares, Al Tabosh, Saadeddin, El Mouhayyar, & Aridi, 2016).

Cheung and collaborators demonstrated that age, gender, study load, and academic performance were factors associated with mental health conditions, such as depression and anxiety (Cheung, Tam, Tsang, Zhang, & Lit, 2020). Moreover, many studies have shown that medical students at the start of their careers presented a greater burden of psychiatric morbidity when compared to students of other disciplines as well as the general population (Fares et al., 2016; Suárez & Fernández, 2020). Indeed, in Mexico and Colombia, medical students were shown to have significant levels of depression (25-50%), anxiety (50-60%), and stress (60-70%; Granados Cosme et al., 2020; Saldaña Orozco, De Loera Soto, & Madrigal Torres, 2017; Pabón, Espinosa, Correa, Ríos, & Gutiérrez, 2018; Suárez & Fernández, 2020). Recently, increased time spent in front of electronic devices and social networks, which can lead to less social interaction, can augment depression and unhappiness among younger generations (Berryman, Ferguson, & Negy, 2018).

On January 30, 2020, the World Health Organization declared COVID-19 as a pandemic (World Health Organization, 2020). Since then, numerous outlets have suggested that the measures taken during this period could affect mental health (Brooks et al., 2020). There was a worldwide increase in the use of social media during the quarantine (Tsao et al., 2021), which is postulated to affect mental health (Karim, Oyewande, Abdalla, Ehsanullah, & Khan, 2020). Previous studies have highlighted the harmful influence of quarantines linked to viral epidemics/pandemics on mental health. For example, in Australia, approximately 34% of horse owners quarantined for several weeks because of an equine influenza outbreak, reported higher psychological distress, compared with around 12% in the general population (Taylor, Agho, Stevens, & Raphael, 2008). Moreover, Brooks and collaborators reported a positive association between the length of the quarantine and post-traumatic stress disorder symptoms, avoidance behaviors, and anger. Furthermore, they pointed out that among hospital staff, being quarantined is a predictor of acute stress disorder and depressive symptoms (Brooks et al., 2020). This is similar to medical students, in which students from a private medical university during the SARS outbreak in 2003 demonstrated that they presented with elevated degrees of anxiety (Loh, Ali, Ang, & Chelliah, 2006). Additionally, medical students presented with higher levels of anxiety during the MERS (Al-Rabiaah et al., 2020) and H1N1 (Swine) flu pandemic (Wheaton, Abramowitz, Berman, Fabricant, & Olatunji, 2012). Therefore, it is expected that the rate of these disorders should increase with the COVID-19 pandemic.

With the worsening of mental health associated with the medical school format, coupled with the cessation of fundamental face-to-face activities and social distancing due to the COVID-19 pandemic, it was postulated that levels of depression, anxiety, and stress could be augmented among medical students. The objective of this study was to determine levels of depression, anxiety, and stress in medical students from Mexico and Colombia during the COVID-19 pandemic. Furthermore, levels of depression, anxiety, and stress were compared by gender, educational level, and country (Mexico versus Colombia).

METHOD

Design of the study

A cross-sessional study design using an Internet interface.

Subjects / description of the sample

The sample population was recruited by using a cluster, volunteer sampling method. The project was first conceived at BUAP, in which other institutions were available via the DELFIN program. The DELFIN program allows students within Mexico as well as Colombia, Costa Rica, Nicaragua, and Peru to participate in research. The project was published within the program, in which potential students contacted the corresponding author. After a virtual meeting, the students were explained to contact only students within their medical school, in which the students were asked to post a general invitation to participate on the university's message board, by e-mail, and by snowball sampling contact. They were to explain that the participant anonymity would be maintained, only known to the corresponding author and selected personnel.

To be included in the study, the participants had to be current, active students, between the ages of 18 to 25 years old, belonging to a medical school, and who were taking their course material in a virtual format during the pandemic. Those exclude were students who did not belong to the medical school (full-time) or those who were taking classes as well as practices in a face-to-face or semi-face-to-face format, taking or started taking any medication that could alter moods, had a traumatic family or personal event that could affect the results other than due to the pandemic, partially or early terminated questionnaires, or a previous diagnosis of a psychopathological disorder.

Places

The participant pool consisted of medical students from different universities in Mexico (Puebla, Chihuahua, State of Mexico, Veracruz, Guerrero, Morelos, Nuevo Leon, Tlaxcala, Oaxaca, Durango, Coahuila, Jalisco, Baja California, Tamaulipas, Sinaloa) and Cartagena, Colombia.

Measurements

The online instrument collected demographic and specific data. The demographic data collected were gender (biological sex), age, country, residency (urban or rural), mask type and usage, school year, and type of work. Problems with work, school, and other (serious) problems, the participants were asked to identify. Lastly, concepts about academic achievement, physical activity, and internet access were also collected.

Developed by Lovibond & Lovibond, the Depression Anxiety Stress Scales-21 (DASS-21) questionnaire proved to be a reliable and consistent instrument that was validated for Spanish-speaking populations (Ruiz, Martín, Falcón, & González, 2017; Yohannes, Dryden, & Hanania, 2019). This instrument, comparable with the Likert technique, measured the states of depression, anxiety, and stress using three different scales containing seven items each with four possible answers: 0. did not apply to me at all, 1. applied to me to some degree or some of the time, 2. applied to me to a considerable degree or a good part of the time, and 3. applied to me very much or most of the time. Items corresponding to depression were questions 3, 5, 10, 13, 16, 17, and 21, for anxiety were questions 2, 4, 7, 9, 15, 19, and 20, and for stress were questions 1, 6, 8, 11, 12, 14, and 18. For specific wording of the DASS-21 questionnaire, see Supplement Table 1.

Procedure

This study carried out between July 2020 and January 2022 using an online questionnaire through health-survey plat-

Table 1
The level of depression, anxiety, and stress for medical students, as determined by the DASS-21 questionnaire, stratified by gender and education level

	Rank	Gender[a]			Year[c]		
		Male	Female	p-value[b]	Advance	Basic	p-value[b]
Depression	Overall score	5.8 ± 5.2	7.2 ± 5.3	.007*	6.0 ± 5.0	7.0 ± 5.4	.084
	Normal	77.9 (70.8-83.8)	71.0 (66.2-76.1)	.286	80.0 (72.3-86.9)	70.6 (65.5-76.0)	.204
	Mild	12.3 (7.1-18.2)	13.6 (9.6-17.6)		10.0 (4.6-15.4)	14.5 (10.5-18.2)	
	Moderate	9.7 (5.2-14.3)	14.7 (10.7-18.8)		10.0 (5.4-15.4)	14.2 (10.1-18.6)	
	Severe	0 (N/A)	.7 (0-1.8)		0 (N/A)	.7 (0-1.7)	
	Extremely severe	0 (N/A)	0 (N/A)		0 (N/A)	0 (N/A)	
Anxiety	Overall score	7.6 ± 4.9	9.5 ± 4.4	< .001*	7.5 ± 4.2	9.4 ± 4.8	< .001*
	Normal	57.1 (49.4-64.9)	36.7 (31.3-42.3)	.002*	53.1 (44.6-60.8)	40.2 (34.8-45.6)	.012*
	Mild	12.3 (7.1-18.2)	15.4 (11.4-20.2)		16.9 (10.0-23.8)	13.2 (9.5-17.2)	
	Moderate	21.4 (15.6-28.6)	33.8 (28.3-39.0)		23.8 (16.9-31.5)	31.8 (26.4-36.8)	
	Severe	7.1 (3.2-11.0)	12.1 (8.5-15.8)		6.2 (2.3-10.0)	12.2 (8.8-16.2)	
	Extremely severe	1.9 (0-4.5)	1.8 (.4-3.7)		0 (N/A)	2.7 (1.0-4.7)	
Stress	Overall score	4.5 ± 4.1	6.3 ± 4.5	< .001*	4.5 ± 3.8	6.2 ± 4.6	< .001*
	Normal	96.8 (93.5-99.4)	94.9 (92.3-97.4)	.471	97.7 (94.6-100.0)	94.6 (91.9-97.0)	.317
	Mild	3.2 (.6-6.5)	4.4 (2.2-7.0)		2.3 (0-5.4)	4.7 (2.7-7.1)	
	Moderate	0 (N/A)	.7 (0-1.8)		0 (N/A)	.7 (0-1.7)	
	Severe	0 (N/A)	0 (N/A)		0 (N/A)	0 (N/A)	
	Extremely severe	0 (N/A)	0 (N/A)		0 (N/A)	0 (N/A)	

Notes: Values are either frequency (% ± 95% confidence interval) or mean ± standard deviation.
[a] Gender was based on the participant's biological sex.
[b] p-values were calculated using either the chi-squared test for categorical data (normal, mild, moderate, severe, or extremely severe) or either Student's T test or Mann U test for overall score.
[c] Based participants year of education (semester), they were either classified as basic (school years 1 to 3) or advanced (school years 4 to 6).
* Indicates a significant difference (*p* < .05, two-tailed) between the two genders.

Table 2
The risk of developing depression, anxiety, or stress based on gender and school year

		Gender[a]	Year[b]	Negative[c]	Positive[c]	Odds ratio[d]	95% CI[d]	p-value[d]
Depression	Male	Advance	42	8	1.00	Referent	-
		Basic	78	26	1.69	.74-4.19	.219
	Female	Advance	62	18	1.48	.62-3.80	.387
		Basic	131	61	2.34	1.10-5.51	.026*
Anxiety	Male	Advance	37	13	1.00	Referent	-
		Basic	51	53	2.89	1.42-6.15	.003*
	Female	Advance	32	48	4.15	1.97-9.14	< .001*
		Basic	68	124	5.05	2.59-10.36	< .001*
Stress	Male	Advance	50	0	1.00	Referent	-
		Basic	99	5	5.58	.61-738.33	.148
	Female	Advance	77	3	4.56	.43-618.26	.238
		Basic	181	11	6.40	.81-826.53	.088

Notes: [a] Based participants year of education (semester), they were either classified as basic (school years 1 to 3) or advanced (school years 4 to 6).
[b] Gender was based on the participant's biological sex.
[c] Positive cases were participants identified as either mild, moderate, severe, or extremely severe, whereas negative cases were participants identified as normal.
[d] Odds ratios and 95% confidence intervals were calculated using R logitf package (Firth Logistic regression).
* Indicates a significant result ($p < .05$, two-tailed).

form (https://health-survey-2021.vercel.app/). The online instrument that used to evaluate the participants divided into five different sections that corresponded to 1. invitation to participate, 2. informed consent (identification data and signed photographic consent), 3. general/demographic data, 4. learning difficulties, and 5. the DASS-21 questionnaire. The data and information obtained during this study handled according to Article 14.1 of the Federal Law on Protection of Personal Data. Lastly, study conducted by the CHERRIES guidelines (Eysenbach, 2004; Supplement Table 2).

Statistical analysis

All analyses were carried out with the Statistical Package for the Social Sciences software (SPSS v26.0, Chicago, IL USA) or with R software (Ripley, 2001). The normality of the data assessed by the Shapiro–Wilk test. Differences between groups were determined using the chi-squared test for categorical data whereas, depending on the normality of the data, either Student's T-test or the Mann U test used for continuous data. Due to zero values in the referent group, Firth Logistic Regression was used to determine the odds ratio (OR) and 95% confidence interval (95% CI), to evaluate the level of risk for depression, anxiety, and stress when stratified by gender and school year (basic: school years 1-3 and advanced: school years 4-6). Firth Logistic Regression was performed with R using the logit package. p-values < .05 (two-tailed) were considered statistically significant.

The sample size calculated using: $n = (NZ^2 p [1-p]) / (e^2 [N-1] + Z^2 p [1-p])$, where n = sample size, N = population of medical students in participating countries, p = probability of occurrence, Z = confidence level critical value and e = maximum estimate error. Note, the number of medical students/ graduates is similar for Mexico (11.6 per 100,000 inhabitants) and (11.7 per 100,000 inhabitants) Colombia (OECD, 2022). The population of students enrolled in medical school in Mexico and Colombia is around 15,000 and 6,000, respectively, totaling 21,000. The prevalence rates for depression, anxiety, and stress in medical students can range between 50-60%; therefore, a probability of .5 was used for the largest sample size. A sample size of at least 378 was determined using the following assumptions: N = 21,000, 95% confidence interval (Z = 1.96), e = 5%, and p = .5.

Ethical considerations

All who agreed to participate gave signed photographic consent, by the Declaration of Helsinki. This study was approved by the Ethics Committee of the Vice-Rector's Office for Research and Postgraduate Studies at the Benemérita Universidad Autónoma de Puebla (approval number: Registry number 910, book 2, sheet 156 [SIEP/C.I/136/2022]).

RESULTS

Selection of participants

Of the 566 participants that agreed to participate and completed the survey, 140 were excluded for being < 18 or > 25 years old or did not have photographic-signed consent. Which resulted in 426 students from Mexico and Colombia being assessed (Supplement Table 3). When stratified by school year, 69.5% were in their basic years and 30.5% were in their advanced years, which resulted in a significant difference in the ages of the two groups. However, when
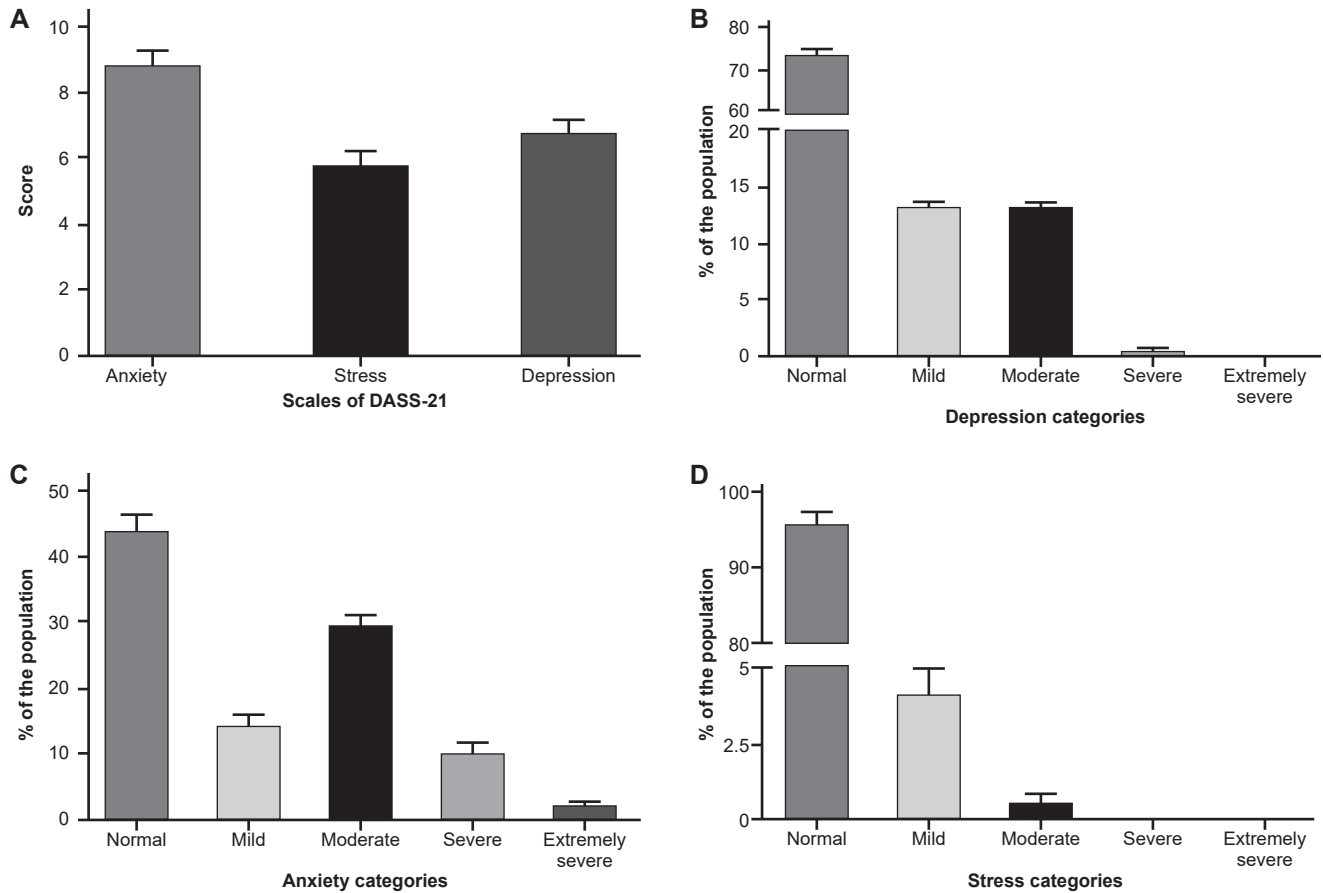
Figure 1. The prevalence and severity of depression, anxiety, and stress among Mexican and Colombian medical students during the COVID-19 Pandemic. **A)** Overall scores for depression (right bar), anxiety (left bar), and stress (center bar). **B)** Depression, **C)** anxiety, and **D)** stress were categorized as normal, mild, moderate, severe and extremely severe. The bar height and lines correspond to the average score and 95% confidence interval.

stratified by gender, 63.8% were female and no difference in age was observed.

Depression, anxiety, and stress among Mexican and Colombian medical students

The average scores for depression, anxiety, and stress using the DASS-21 questionnaire for Mexicans and Colombians were 6.7 ± 1.2, 8.8 ± 1.2, and 5.6 ± 1.2, respectively (Figure 1A). For depression, when the scores were categorized, most of the students were normal with few defined as having significant depression (26.6%, Figure 1B). For anxiety, when the scores were categorized, most of the students presented with some level of anxiety (55.9%, Figure 1C). Interestingly, for stress, a majority of the students were normal (95.5%, Figure 1D).

Using the data for Mexicans and Colombia together, when stratified by gender, females had significantly higher overall scores for depression (.24-fold increase), anxiety (.25-fold increase), and stress (.40-fold increase) than males ($p < .01$, Table 1). Moreover, females presented with higher

severity for anxiety than males (63.3% versus 42.9%, respectively, Table 1), an observation not seen with depression or stress. The frequency of the responses to the DASS-21 questionnaire, categorized by school year or gender is shown in Supplement Table 1.

It has been shown that as medical student progress through their education, depression, anxiety, and stress increase; therefore, Mexican and Colombians medical students were stratified by school year (Table 1). Depression's overall score as well as its categories were not affected by the student's school year. However, for anxiety and stress, there was a difference between the overall score for basic and advanced years, in which basic years were associated with higher scores (.25- and .38-fold increase, respectively). When stratified into normal, mild, moderate, and severe, there was no statistical difference in the distribution of stress; however, for anxiety, there was an increase in the prevalence of the moderate form for basic years, with a significant decrease in the mild and severe forms for a student in their advance years.

The risk associated with gender and school year for developing depression, anxiety, and stress was evaluated

Table 3
The risk of developing depression, anxiety, or stress based on the medical students' location (Mexico versus Colombia)

Country	Negative[a]	Positive[a]	Odds ratio[b]	95% CI[b]	p-value[b]
Depression					
Colombia	64	12	1.00	Referent	-
Mexico	249	101	2.16	1.12-4.18	.022*
Anxiety					
Colombia	45	31	1.00	Referent	-
Mexico	143	207	1.10	1.27-3.48	.004*
Stress					
Colombia	74	2	1.00	Referent	-
Mexico	333	17	1.89	.43-8.35	.402

Notes: [a] Positive cases were participants identified as either mild, moderate, severe, or extremely severe, whereas negative cases were participants identified as normal.
[b] Odds ratios and 95% confidence intervals were calculated using R logitf package (Firth Logistic regression).
* Indicates a significant result ($p < .05$, two-tailed).

(Table 2). For depression, using males in advanced years as the referent, only females in their basic years demonstrated a significant increase in risk. Therefore, being a male doesn't affect developing depression, as well as being a female in her advanced years. However, being a female starting medical school (1-3 years) did show an increased risk for depression, even when compared to male students in their basic years (a .38-fold increase). For Anxiety, when males in their advanced years were compared to males in their basic years, a significant increase in the risk of almost 3-fold was observed. On the other hand, when females in their advanced years were compared to females in their basic years, a .21-fold increase was observed. Stress did not show any significant difference between any of the comparisons. Lastly, due to the different COVID-19 mandates between Mexico and Colombia, the group was stratified by country (Table 3). For Mexico, there was an increased risk for depression and anxiety but not for stress, when compared to Colombia as the referent.

DISCUSSION AND CONCLUSION

Using the DASS-21 questionnaire, significant levels of depression (27%), anxiety (56%), and stress (5%) were determined for Mexican and Colombian medical students. When compared by gender, level of education, and country, females showed significantly higher scores for anxiety and stress than males that are in their basic years of medical training. Moreover, Mexico had an increased risk for depression and anxiety, when compared to Colombia.

Anxiety was the most prevalent psychopathological condition, regardless of sociodemographic variables, such as gender, age, and school year, which suggests that the confinement and lifestyle restrictions caused by the pandemic generated anxiety among this subset of students. For the general population, Shigemura and collaborators demonstrated that overwhelming and sensational news headlines as well as imagery add to anxiety (Shigemura, Ursano, Morganstein, Kurosawa, & Benedek, 2020). It is postulated that rumors and hyped information filled these individuals in the absence of information. Additionally, Rubin and Wessely (2020) proposed that during disease outbreaks, community anxiety can rise following the first death, increased media reporting, and an escalating number of new cases (Rubin & Wessely, 2020). In Mexico and Colombia, these characteristics were met, fostering anxiety in our group. Moreover, mass quarantines are likely to raise anxiety substantially (Rubin & Wessely, 2020). Medical students in Saudi Arabia reported higher levels of anxiety during the MERS pandemic (Al-Rabiaah et al., 2020). Moreover, medical students in South Carolina also reported higher levels of anxiety during the H1N1 flu (Wheaton et al., 2012). Thus, it is reasonable to presume that the effects due to the COVID-19 pandemic are the causes of the increased prevalence and risk of anxiety for these medical students, and a baseline, which is provided here, is necessary to evaluate an effect on their future performance.

Before the COVID-19 pandemic, one of the most recent studies found that the prevalence of depression was 32.7% among medical students in China, whereas the prevalence of anxiety was 27.2% (Mao et al., 2019). As reported for medical students in India, the prevalence of moderate to severe depression was 14.9%, whereas stress was exceedingly high at 83.7% for moderate to very-high levels (Kumar, Kattimani, Sarkar, & Kar, 2017). Here, our values were similar, in which depression was 13.3%; however, severe stress was only 4.5% for the group. This does suggest that the pandemic impacted the levels of depression and stress for our group and other medical students around the world.

Typically, medical students reported that the causes of stress were difficulty in understanding the content, feeling

incompetent in managing the patient, feeling compelled to participate in the scenario, and competition with team members to name a few (Pai, Ram, Madan, Soe, & Barua, 2014). Therefore, it is postulated that any effect the pandemic has had on these medical students will be minimal for their future performance when only considering stress and depression; however, the lack of these stressors could put these medical students at a disadvantage due to inexperience and failure to resolve these stressors. As indicated by Pai and collaborates, repeated training sessions reduce stress, which these students did not receive (Pai et al., 2014).

It was shown that depression and anxiety are more prevalent in females. In a systematic review of medical students from the USA and Canada, they indicated higher rates of psychosocial distress among female students (Dyrbye, Thomas, & Shanafelt, 2006). However, our results show a higher female prevalence for anxiety only in firsts years students, with a significant decrease in advanced years of medical training. This suggests that levels of anxiety decline as the students adapt to the medical school program. In support of this, Brenneisen and collaborators demonstrated that as female students progress through medical school, their Beck Depression Inventory and State-Trait Anxiety Inventory scores decreased (Brenneisen Mayer et al., 2016). They also confirm our results in which female medical students were more prone to have depression and anxiety symptoms than males.

COVID-19 has exacerbated educational inequalities across countries. Numerous studies published during the pandemic have demonstrated a country-dependent difference in levels of depression, anxiety, and stress (Bibi, Lin, Zhang, & Margraf, 2020). In our study, the DASS-21 scores for Colombian and Mexican students were found to be different, where a higher risk of suffering from depression and anxiety was associated with Mexicans. These inequalities in most cases are multifactorial and are related to the school's operating standards, socioeconomics, geographic conditions, and other variables that make it difficult to guarantee equitable coverage for the entire territory and social strata. In Colombia, the COVID-19 restrictions (Ministerio de Salud y Protección Social, 2020) were more severe than in Mexico (Diario Oficial de la Federación, 2020). These different factors have a direct impact on how the two countries went through the pandemic. One interesting occurrence was the country that had more sanitary restrictions had lowers levels of these psychopathologies. This can be related to the concept that people care about not being infected and all the government mandatories gave them a feeling of security.

This study has a few limitations. First, the response rate was lower for advanced-year medical students and may limit the interpretation of the findings. Second, the sample selected for this study was specifically medical students. The results obtained may not apply to students outside of this designation. Third, this study did not examine the psy-chological impact that COVID-19 has had on all Mexican and Colombian students. Fourth, the regional differences between Mexico and Colombia, as well as the regional differences within each country, were not taken into consideration. Even though the format for most medical programs, such as the number of classes, the order in which the classes are taken, the literature used, and the methods of teaching, are similar between each school, the number of medical schools in Mexico (113 institutions) and Colombia (61 institutions), the potential of socioeconomic and demographical factors could influence the results shown here. For future studies, a more complex sampling methodology should be implemented to be able to assess these factors. Moreover, the type of school, private or public, could affect the association. Here, all schools that participated were public institutions. Fifth, potential sample/selection bias could be present. For the overall sample, the sample size was sufficient but the reason for participating in the study was unknown. Moreover, the representativeness of the sample was not qualified. Within Mexico as well as Colombia and between each country, the demographic and socioeconomic factors do range. However, during the period in which the study occurred, implementation of COVID-19 restrictions did vary between each state in Mexico and Colombia. Nevertheless, the effects of the COVID-19 pandemic restrictions between each state were similar. Lastly, the previous assessments for depression, anxiety, and stress were not available. Here, it was observed that the rate of depression, anxiety, and stress were similar to pre-pandemic levels. However, the influence of the pandemic on depression, anxiety, and stress could not be deduced, as for the difficulty of predicting a pandemic and getting the project's approval. Nevertheless, future studies are being designed in which students are to be followed during their medical school, independent of the events that take place.

A high prevalence of anxiety and depression was observed in medical students from Mexico and Colombia. Females and students early in their medical training were factors associated with an increase in depression and anxiety. This study serves as a baseline analysis for future assessments of these students, which can determine how the COVID-19 pandemic has affected their future performance as clinicians. Lastly, Mexicans were more at-risk to suffer from higher levels of depression and anxiety than Colombians.

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Conflict of interest

The authors declare they have no conflicts of interest.

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APPENDIX

Supplement Table 1
Frequency of responses to the DASS-21 questionnaire for the total cohort and categorized by school year or gender

#	Question content	All	Year[a]			Gender[b]		
			Advanced	Basic	p-value[c]	Male	Female	p-value[c]
1.	I found it hard to wind down.							
	Did not apply	12.9 (9.9-16.0)	20.8 (13.8-28.4)	9.5 (6.1-12.8)	< .001*	24.0 (16.9-31.8)	6.6 (3.7-9.6)	< .001*
	Some of the time	46.5 (42.0-50.9)	47.7 (38.5-56.9)	45.9 (40.2-51.7)		44.2 (36.4-51.9)	47.8 (41.9-53.7)	
	Considerable amount of time	33.8 (29.1-38.5)	30.8 (23.1-38.5)	35.1 (29.7-40.9)		27.3 (20.8-34.4)	37.5 (32.0-43.7)	
	Most of the time	6.8 (4.5-9.2)	.8 (.0-3.1)	9.5 (6.4-12.8)		4.5 (1.3-7.8)	8.1 (4.8-11.4)	
2.	I was aware of dryness of my mouth.							
	Did not apply	40.4 (35.9-45.3)	50.8 (42.3-60.0)	35.8 (30.4-41.9)	.023*	46.1 (38.3-53.9)	37.1 (32.0-43.0)	.020*
	Some of the time	34.7 (30.0-39.7)	31.5 (23.8-40.0)	36.1 (30.4-41.6)		37.7 (30.5-46.1)	33.1 (27.6-38.2)	
	Considerable amount of time	20.2 (16.2-23.9)	13.8 (8.5-20.0)	23.0 (18.2-27.7)		13.0 (7.8-18.2)	24.3 (19.5-29.0)	
	Most of the time	4.7 (2.8-6.8)	3.8 (.8-7.7)	5.1 (3.0-7.8)		3.2 (.6-5.8)	5.5 (2.9-8.1)	
3.	I couldn´t seem to experience any positive feeling at all.							
	Did not apply	34.3 (29.8-38.7)	45.4 (36.9-53.8)	29.4 (24.3-34.8)	.007*	45.5 (37.0-53.9)	27.9 (22.8-33.5)	.002*
	Some of the time	39.7 (34.7-44.4)	36.2 (27.7-44.6)	41.2 (35.8-47.0)		31.2 (23.4-39.0)	44.5 (39.0-50.4)	
	Considerable amount of time	21.4 (17.4-25.4)	16.2 (10.0-23.1)	23.6 (18.6-28.4)		20.1 (14.3-26.6)	22.1 (17.3-27.2)	
	Most of the time	4.7 (2.8-6.8)	2.3 (.0-5.4)	5.7 (3.4-8.4)		3.2 (.6-6.5)	5.5 (2.9-8.5)	
4.	I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion).							
	Did not apply	65.3 (61.3-69.9)	66.9 (59.2-74.6)	64.5 (59.8-69.6)	.174	72.7 (66.2-79.2)	61.0 (55.1-67.3)	.111
	Some of the time	26.8 (22.8-30.8)	29.2 (21.5-37.7)	25.7 (20.9-30.7)		21.4 (14.9-27.3)	29.8 (23.9-35.7)	
	Considerable amount of time	7.0 (4.7-9.4)	3.8 (0.8-7.7)	8.4 (5.4-11.8)		5.2 (1.9-9.1)	8.1 (5.1-11.4)	
	Most of the time	.9 (.2-1.9)	.0 (N/A)	1.4 (.3-2.7)		.6 (.0-1.9)	1.1 (.0-2.6)	
5.	I found it difficult to work up the initiative to do things.							
	Did not apply	20.0 (16.4-23.9)	18.5 (13.1-25.4)	20.6 (15.9-25.0)	.788	27.3 (20.1-34.4)	15.8 (11.4-20.6)	.042*
	Some of the time	40.4 (35.7-45.3)	42.3 (33.8-50.8)	39.5 (33.8-45.3)		37.7 (29.9-45.5)	41.9 (35.7-47.8)	
	Considerable amount of time	28.6 (24.4-33.3)	30.0 (22.3-37.7)	28.0 (22.6-33.4)		25.3 (18.8-32.5)	30.5 (25.3-36.0)	
	Most of the time	11.0 (8.0-14.1)	9.2 (4.6-14.6)	11.8 (8.4-15.5)		9.7 (5.2-14.9)	11.8 (8.1-15.8)	
6.	I tended to over-react to situations.							
	Did not apply	29.1 (24.9-33.6)	30.8 (23.1-40.0)	28.4 (23.0-33.4)	.205	39.0 (31.8-46.8)	23.5 (18.8-29.0)	.002*
	Some of the time	37.1 (32.6-41.8)	42.3 (33.1-50.8)	34.8 (29.4-39.5)		35.7 (27.9-43.5)	37.9 (32.0-43.4)	
	Considerable amount of time	22.5 (18.5-26.5)	19.2 (12.3-26.2)	24.0 (19.3-29.1)		14.9 (9.7-20.1)	26.8 (21.3-32.7)	
	Most of the time	11.3 (8.5-14.6)	7.7 (3.1-12.3)	12.8 (9.5-16.9)		10.4 (5.8-15.6)	11.8 (7.7-15.8)	
7.	I experienced trembling (e.g., in the hands).							
	Did not apply	55.4 (50.7-60.3)	61.5 (53.1-70.0)	52.7 (47.0-58.4)	.003*	63.6 (55.9-71.4)	50.7 (44.9-56.3)	.020*
	Some of the time	29.3 (24.9-33.6)	32.3 (24.6-40.0)	28.0 (23.3-33.1)		27.3 (20.1-35.1)	30.5 (25.0-36.0)	
	Considerable amount of time	11.7 (8.7-14.8)	3.1 (.8-6.2)	15.5 (11.5-19.6)		7.8 (3.9-11.7)	14.0 (9.9-18.4)	
	Most of the time	3.5 (1.9-5.2)	3.1 (.8-6.2)	3.7 (1.7-5.7)		1.3 (.0-3.2)	4.8 (2.6-7.3)	
8.	I felt that I was using a lot of nervous energy							
	Did not apply	24.9 (20.9-29.1)	30.8 (23.1-38.5)	22.3 (17.6-27.0)	.026*	37.7 (29.9-45.5)	17.5 (13.2-22.1)	< .001*
	Some of the time	34.7 (30.0-39.4)	38.5 (30.0-46.9)	33.1 (27.7-38.2)		32.5 (24.7-39.6)	36.0 (30.1-41.9)	
	Considerable amount of time	31.0 (26.3-35.2)	26.2 (18.5-33.1)	33.1 (27.7-38.2)		24.0 (17.5-31.2)	34.9 (29.4-41.2)	
	Most of the time	9.4 (6.8-12.4)	4.6 (1.5-8.5)	11.5 (8.1-15.2)		5.8 (2.6-9.7)	11.4 (7.7-15.1)	
9.	I was worried about situations in which I might panic and make a fool of myself.							
	Did not apply	30.8 (26.5-35.0)	37.7 (30.0-46.2)	27.7 (22.6-33.1)	.041*	39.0 (31.2-46.8)	26.1 (21.0-31.3)	.010*
	Some of the time	28.9 (24.6-33.3)	31.5 (23.8-40.0)	27.7 (23.0-32.8)		30.5 (24.0-37.7)	27.9 (22.4-33.8)	
	Considerable amount of time	26.1 (21.8-30.0)	21.5 (14.6-28.5)	28.0 (23.0-33.1)		20.1 (14.3-26.6)	29.4 (24.3-34.9)	
	Most of the time	14.3 (10.8-17.6)	9.2 (3.8-14.6)	16.6 (12.5-20.6)		10.4 (5.8-15.6)	16.5 (12.5-21.0)	
10.	I felt that I had nothing to look forward to.							
	Did not apply	42.3 (37.8-46.9)	46.9 (39.2-56.2)	40.2 (34.8-45.9)	.550	49.4 (40.9-56.5)	38.2 (32.4-43.8)	.109
	Some of the time	29.8 (25.6-34.0)	29.2 (21.5-36.9)	30.1 (25.0-35.1)		26.0 (19.5-33.8)	32.0 (26.5-37.1)	
	Considerable amount of time	18.8 (15.0-22.5)	16.2 (10.0-22.3)	19.9 (15.2-24.7)		14.9 (9.1-20.8)	21.0 (16.2-26.1)	
	Most of the time	9.2 (6.6-12.2)	7.7 (3.1-12.3)	9.8 (6.8-13.2)		9.7 (5.8-14.3)	8.8 (5.5-12.1)	
11.	I found myself getting agitated.							
	Did not apply	15.0 (11.7-18.5)	16.9 (10.8-23.8)	14.2 (10.5-18.2)	.098	16.2 (10.4-22.7)	14.3 (10.7-18.4)	.397
	Some of the time	40.1 (35.4-45.1)	43.1 (34.6-51.5)	38.9 (33.8-44.3)		43.5 (35.7-51.3)	38.2 (32.7-44.1)	

Supplement Table 1 (continued)

Considerable amount of time	33.8 (29.3-38.3)	34.6 (26.9-43.1)	33.4 (28.0-38.5)		28.6 (21.4-35.7)	36.8 (30.5-42.6)	
Most of the time	11.0 (8.0-14.1)	5.4 (2.3-9.2)	13.5 (10.1-17.2)		11.7 (7.1-16.9)	10.7 (7.0-14.3)	
12. I found it difficult to relax.							
Did not apply	16.9 (13.6-20.7)	24.6 (17.7-31.5)	13.5 (9.5-17.6)	.011*	21.4 (14.9-27.9)	14.3 (10.3-18.4)	.151
Some of the time	37.1 (32.9-41.5)	38.5 (30.8-46.2)	36.5 (31.1-41.9)		39.0 (31.2-46.8)	36.0 (30.5-41.9)	
Considerable amount of time	32.4 (27.9-36.8)	28.5 (21.5-36.2)	34.1 (28.4-39.9)		27.9 (20.8-35.0)	34.9 (29.1-40.8)	
Most of the time	13.6 (10.6-16.7)	8.5 (3.8-13.8)	15.9 (12.2-20.3)		11.7 (6.5-16.9)	14.7 (10.7-18.1)	
13. I felt downhearted and blue.							
Did not apply	24.6 (20.9-28.6)	30.8 (23.1-39.2)	22.0 (17.2-26.7)	.282	33.1 (26.0-40.3)	19.9 (15.1-24.6)	.001*
Some of the time	40.4 (35.7-45.1)	37.7 (29.2-46.2)	41.6 (35.5-47.0)		42.9 (35.1-50.6)	39.0 (32.7-44.5)	
Considerable amount of time	22.1 (18.3-26.1)	20.0 (13.1-26.9)	23.0 (18.2-28.0)		13.6 (8.4-19.5)	26.8 (21.7-32.0)	
Most of the time	12.9 (10.1-16.2)	11.5 (6.2-16.9)	13.5 (9.8-17.2)		10.4 (5.8-15.6)	14.3 (10.3-18.4)	
14. I was intolerant of anything that kept me from getting on with what I was doing.							
Did not apply	41.5 (36.9-46.2)	53.1 (44.6-62.3)	36.5 (31.1-42.2)	.003*	52.6 (44.8-61.7)	35.3 (29.8-40.8)	.004*
Some of the time	39.0 (34.0-43.4)	36.2 (28.5-44.6)	40.2 (34.8-45.6)		29.9 (22.1-37.0)	44.1 (38.2-50.4)	
Considerable amount of time	14.1 (11.0-17.4)	8.5 (4.6-13.1)	16.6 (12.2-21.3)		11.7 (2.6-6.5)	15.4 (11.0-20.2)	
Most of the time	5.4 (3.3-7.7)	2.3 (.0-5.4)	6.8 (4.1-9.5)		5.8 (1.9-2.6)	5.1 (2.9-8.1)	
15. I felt I was close to panic.							
Did not apply	53.8 (49.1-58.9)	57.7 (50.0-66.2)	52.0 (46.6-57.1)	.085	65.6 (57.8-73.4)	47.1 (41.2-53.3)	< .001*
Some of the time	30.0 (25.8-34.3)	32.3 (24.6-40.8)	29.1 (24.0-34.1)		24.7 (18.2-31.8)	33.1 (27.6-38.6)	
Considerable amount of time	12.7 (9.6-16.0)	9.2 (4.6-13.8)	14.2 (10.5-18.6)		5.2 (1.9-9.1)	16.9 (12.5-21.7)	
Most of the time	3.5 (1.9-5.4)	.8 (.0-2.3)	4.7 (2.4-7.1)		4.5 (1.3-8.4)	2.9 (1.1-5.1)	
16. I was unable to become enthusiastic about anything.							
Did not apply	48.8 (43.9-53.5)	56.2 (47.7-65.4)	45.6 (40.2-51.0)	.120	56.5 (49.4-64.3)	44.5 (39.0-50.7)	.109
Some of the time	31.7 (27.2-36.1)	28.5 (20.8-36.2)	33.1 (27.7-38.9)		26.0 (18.8-33.1)	34.9 (29.0-40.4)	
Considerable amount of time	14.3 (11.3-17.8)	13.1 (7.7-20.0)	14.9 (10.8-19.3)		12.3 (7.1-17.5)	15.4 (11.4-19.9)	
Most of the time	5.2 (3.3-7.5)	2.3 (.0-5.4)	6.4 (3.7-9.5)		5.2 (1.9-9.1)	5.1 (2.6-7.7)	
17. I felt I wasn´t worth much as person.							
Did not apply	48.1 (43.2-53.1)	51.5 (43.1-60.8)	46.6 (40.9-52.4)	.683	58.4 (50.6-66.2)	42.3 (36.8-48.2)	.008*
Some of the time	26.8 (22.5-30.8)	26.9 (19.2-34.6)	26.7 (21.3-32.1)		24.0 (17.5-31.2)	28.3 (23.2-33.8)	
Considerable amount of time	14.1 (10.8-17.6)	11.5 (6.2-16.9)	15.2 (11.5-19.3)		9.1 (4.5-13.6)	16.9 (12.5-21.7)	
Most of the time	11.0 (8.2-13.8)	10.0 (5.4-15.4)	11.5 (7.8-15.2)		8.4 (4.5-13.0)	12.5 (8.8-16.5)	
18. I felt that I was rather touchy.							
Did not apply	19.7 (16.2-23.7)	24.6 (17.7-32.3)	17.6 (13.5-22.0)	.040*	29.9 (22.7-37.6)	14.0 (9.9-18.4)	< .001*
Some of the time	38.5 (33.8-42.7)	40.8 (32.3-50.0)	37.5 (31.8-42.9)		39.0 (31.8-46.8)	38.2 (32.7-43.8)	
Considerable amount of time	27.5 (23.5-31.9)	26.9 (18.5-34.6)	27.7 (22.3-32.8)		18.8 (12.4-24.7)	32.4 (27.2-37.9)	
Most of the time	14.3 (11.3-17.6)	7.7 (3.8-12.3)	17.2 (12.8-22.0)		12.3 (7.1-18.8)	15.4 (11.4-19.9)	
19. I was aware of the action of my heart in the absence of physical exertion.							
Did not apply	42.5 (38.0-47.2)	50.8 (41.5-59.2)	38.9 (33.4-44.3)	.031*	50.0 (42.2-57.1)	38.2 (32.4-43.8)	.027*
Some of the time	33.6 (28.9-37.8)	33.8 (25.4-42.3)	33.4 (28.0-38.5)		33.8 (26.0-40.9)	33.5 (28.3-39.3)	
Considerable amount of time	16.0 (12.4-19.5)	10.8 (5.4-16.9)	18.2 (13.9-22.6)		11.0 (6.5-16.2)	18.8 (14.3-23.5)	
Most of the time	8.0 (5.6-10.8)	4.6 (1.5-8.5)	9.5 (6.4-12.8)		5.2 (1.9-9.1)	9.6 (6.3-13.2)	
20. I felt scared without any good reason.							
Did not apply	43.2 (38.5-48.4)	53.1 (44.6-61.5)	38.9 (33.1-44.3)	.027*	50.6 (42.9-58.4)	39.0 (33.5-44.9)	.051
Some of the time	31.7 (27.2-36.4)	29.2 (21.5-36.9)	32.8 (27.7-38.2)		29.9 (22.7-37.0)	32.7 (26.8-39.0)	
Considerable amount of time	18.1 (14.3-21.8)	13.8 (7.7-20.0)	19.9 (15.5-24.7)		12.3 (7.1-18.2)	21.3 (16.5-26.5)	
Most of the time	7.0 (4.7-9.6)	3.8 (0.8-6.9)	8.4 (5.4-11.5)		7.1 (3.2-11.7)	7.0 (4.0-9.9)	
21. I felt that life was meaningless.							
Did not apply	62.4 (58.2-66.7)	64.6 (56.9-73.1)	61.5 (55.7-66.9)	.777	65.6 (58.4-72.7)	60.7 (54.8-66.2)	.524
Some of the time	20.7 (16.7-24.6)	17.7 (10.8-24.6)	22.0 (17.6-27.0)		16.9 (11.0-23.4)	22.8 (18.0-27.6)	
Considerable amount of time	9.9 (6.8-12.9)	10.8 (5.4-16.2)	9.5 (6.1-12.8)		9.7 (5.2-14.9)	9.9 (6.6-13.6)	
Most of the time	7.0 (4.7-9.9)	6.9 (3.1-11.5)	7.1 (4.4-10.1)		7.8 (3.9-12.3)	6.6 (3.7-9.9)	

Notes: Values are frequency ± 95% confidence interval.
[a] Based participants year of education (semester), they were either classified as basic (school years 1 to 3) or advanced (school years 4 to 6).
[b] Gender was based on the participant's biological sex.
[c] *p*-values were calculated using the chi-squared test.

Supplement Table 2
The Checklist for Reporting Results of Internet E-Surveys (CHERRIES)

Design	Checklist Item	Explanation
Design	Describe survey design	The target population included a convenience sample of medical students from 1st to 10th semester who were students of the Facultad de Medicina Benemérita Universidad Autónoma de Puebla, México and Universidad del Sinú de Cartagena, Colombia.
IRB (Institutional Review Board) approval and informed consent process	IRB approval	The study was registered with Benemérita Universidad Autónoma de Puebla (approval number: Registry number 910, book 2, sheet 156 [SIEP/C.I/136/2022], and November 8, 2021) and approved as a minimal risk study by the Human Research Ethics Committee (HREC).
	Informed consent	Participants, who clicked on the web-link read a more detailed information statement describing the significance of the study and consented electronically before participation. Informed consent has all the requirements.
	Data protection	Responses were password protected and only the research team had access to the login details.
Development and pre-testing	Development and testing	The survey was created with the selection of instruments according to the objective of this project. The survey was modified and adapted to an online platform designed by a student in computer engineering at Tecnológico de Monterrey (Puebla). A pilot test was conducted with the participation of 12 volunteers to define times, grammar, legibility of each of the sentences.
Recruitment process and description of the sample having access to the questionnaire	Open survey versus closed survey	Open survey limited to a single response per person. An email-linked ID is generated, making it impossible to access more than once.
	Contact mode	The contact is made through section representatives who send the survey invitation to their peers (approximately 40 people), once they answer the survey, an ID is generated, and this is provided to the section representatives who send the IDs to the research team.
	Advertising the survey	An invitation in JPG format (image) containing university logos, a brief explanation of the project was created and distributed via e-mail to section representatives. Users can access it with a phone, tablet, computer, etc. through a QR code for convenience.
Survey administration	Web/E-mail	The Survey was accessible via google https://health-survey-2021.web.app/. The responses were automatically captured by the website and then accessible online or an Excel spreadsheet for download.
	Context	Because it was an event aimed at medical students, an exclusive website was created. Participants are not influenced by advertising.
	Mandatory/voluntary	Participation in the survey was voluntary.
	Incentives	As an incentive to participate, an agreement was established with the Psychiatry Department, where participants with levels above the upper limit of depression, anxiety or stress will be channeled to receive support.
	Time/date	Data was collected from September 2020 to July 2021.
	Randomisation of items or questionnaires	Instruments appear randomly to prevent predisposition to responses.
	Adaptive questioning	Dynamic answers were created in the IPAQ-SF instrument with a drop-down menu that opens the next relevant section based on your answer, to avoid the unnecessary projection of questions.
	Number of items	85 items in total. 1st Screen (Welcome) - 1 item; 2nd Screen (Informed consent) - 1 item; 3rd Screen (ID request and sing) - 3 items; 4th Screen (General Data) - 13 items; 5th Screen (DASS 21) - 21 items; 6th Screen (IPAQ SF) - 3 items; 7th Screen - 10 items; 8th Screen - 8 items; 9th Screen - 8 items; 10th Screen - (ID Survey and End).
	Number of screens (pages)	The questionnaire was distributed over ten different screens.
	Completeness check	Each screen has to be completed to be allowed to continue the next screen. If they are questions not answered, a notice will appear "Please answer the questions". All items provide a "not applicable" option.
	Review step	The respondents were able to change their answers at any moment during the survey. They just have to swipe up to get back to the question and select the new option.

Supplement Table 2 (continued)

Design	Checklist Item	Explanation
Response rates	Unique site visitor	The survey was limited to only a unique visitor, this was determined through the register of email-ID that only allowed one try.
	View rate (ratio of unique survey visitors/unique site visitors)	Only the people that completed the full survey were counted. For statistical analysis, the page views and number of unique site visitors were not taken into account.
	Participation rate (ratio of unique visitors who agreed to participate/ unique first survey page visitors)	Unable to calculate the participation rate as the number of people who visited the first page of the survey was not recorded (ie. the unique first survey page visitors).
	Completion rate (ratio of users who finished the survey/users who agreed to participate)	691:566
Preventing multiple entries from the same individual	Cookies used	Cookies were not used.
	IP check	The survey did not register the IP address, so we used the email to identify potential duplicate entries from the same user.
	Log file analysis	The survey registers the respondents based on the information that they provide. The email and Student-ID can be used just once.
	Registration	The survey registers the respondents based on the information that they provide. The email and Student-ID can be used just once. At the end of the survey, an ID-Register will be provided to the respondent and an email will be sent to confirm the right register of the student.
Analysis	Handling of incomplete questionnaires	For statistical analysis of the data, only completed questionnaires were analyzed. The uncompleted questionnaires were archived in the database for further study.
	Questionnaires submitted with an atypical time-stamp	The survey did not have a time limit to be answered. Average response time was 15- 20 minutes. Furthermore, we did not find any surveys/results with an atypical timestamp.
	Statistical correction	None. Since the goal was students attending medical, no complex sampling was performed. Therefore, all analysis were done under simple random sampling.

Supplement Table 3
Characteristics of the total group as well as categorized by school year and gender

Category	Year[a]				Gender[b]		
	Total	Advanced	Basic	*p*- value[c]	Male	Female	*p*-value[c]
Sex (Male/Female)	426 (154/272)	130 (50/80)	296 (104/192)	.511	154	272	-
Age (years)	20.3 ± 1.7	22.1 ± 1.0	19.5 ± 1.3	< .001*	20.4 ± 1.6	20.2 ± 1.7	.343
Residency							
Urban	78.9 (74.9-82.6)	80.0 (72.3-86.0)	78.4 (73.6-83.1)	.706	81.2 (75.3-87.0)	77.6 (72.4-82.7)	.382
Rural	21.1 (17.4-25.1)	20.0 (13.1-27.7)	21.6 (16.9-26.4)		18.8 (13.0-24.7)	22.4 (17.3-27.6)	
Country (state)							
Colombia	76	22	54	.743	31	45	.353
Mexico	350	108	242		123	227	
Puebla	256	67	189		95	161	
Chihuahua	17	12	5		7	10	
State of Mexico	7	4	3		2	5	
Veracruz	10	2	8		1	9	
Guerrero	7	4	3		1	6	
Chiapas	4	4	0		0	4	
Morelos	4	1	3		1	3	
Nuevo León	19	6	13		7	12	
Tlaxcala	5	2	3		3	2	
Oaxaca	2	1	1		0	2	
Durango	1	1	0		0	1	
Coahuila	4	4	0		1	3	
Jalisco	7	0	7		3	4	
Baja California	4	0	4		1	3	
Tamaulipas	2	0	2		1	1	
Sinaloa	1	0	1		0	1	

Notes: Values are either number (n), frequency (% ± 95% confidence interval) or mean ± standard deviation.
[a] Based participants year of education (semester), they were either classified as basic (school years 1 to 3) or advanced (school years 4 to 6).
[b] Gender was based on the participant's biological sex.
[c] *p*-values were calculated using either the chi-squared test for categorical data or either Student's T test or Mann U test for continuous data.
* Indicates a significant difference (*p* < .05, two-tailed) between the two groups.