

The Prevalence of Depression Symptoms and Frequency of Risk Factors in Medical and Nursing Students: A Descriptive Cross-sectional Study

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Objective: Currently, in Puerto Rico, there is a paucity of data regarding emotional health and depression in health professionals, specifically regarding trainees such as medical students and nursing students. The study intended to shed light on the prevalence of depression symptoms among medical and nursing students at a school of medicine in Puerto Rico.

Methods: In the fall of 2019, a descriptive cross-sectional study that included nursing and medical students in their first, second, and third years was performed. A survey consisting of the Patient Health Questionnaire (PHQ-9) and sociodemographic questions were used for data collection. Logistic regression analyses were used to determine the association of PHQ-9 scores and the risk factors linked to depression symptoms.

Results: A total of 173 (83.2%) out of 208 enrolled students participated in the study. Of the participants, 75.7% were medical students and 24.3% were nursing students. Of the risk factors studied, feelings of regret and lack of sleep were associated with a higher frequency of depression symptoms in medical students. For the nursing student population, suffering from a chronic disease was associated with a higher frequency of depression symptoms.

Conclusion: Due to the increased risk of depression in healthcare professionals, identifying risk factors that can be addressed through early changes in behavior, or in institutional policies, is important in terms of working to mitigate the risk of mental health problems in this vulnerable population. [*P R Health Sci J* 2023;42(1):70-76]

Key words: Depression, Medical students, Nursing students, PHQ-9, Mental health

Depression among medical and nursing students is a pervasive issue affecting the healthcare system (1, 2). Not only does this condition potentially decrease healthcare quality, but it also has been a main driver of suicide (attempts and completion) in the medical and nursing population (3). A positive correlation is frequently found between this mental health condition and suicide, which is the second most common cause of death among American medical students and one of the top 15 leading causes of death in Puerto Rico (4, 5).

Unfortunately, students experiencing depression symptoms tend to avoid seeking help, due to fear of embarrassment, confidentiality concerns, and stigmatization (6). Worldwide, studies have reported that people in professions demanding close human contact and emotional engagement, such as medicine, psychology, and nursing, are prone to stress and burnout; these symptoms are even detected before employment (2, 7). U.S. medical and nursing students have higher rates of depression than do other graduate students and the general population (2, 8). As early as the undergraduate level (9), medical and nursing students begin to experience the emotional

and time demands—which have been associated with higher PHQ-9 scores, even in non-clinical settings—that the profession requires (10).

There is limited literature available regarding the prevalence of depression in this sector in Puerto Rico, which is why our project focused on studying depression symptoms among first-, second-, and third-year medical and nursing students. In addition, we explored the frequency and statistical significance of risk factors that have already been associated with depression. We hypothesized that certain aspects, such as year of study, gender, presence of chronic disease, repeating a year of school, and regretting having entered medical school, will be associated with higher depression scores in our population.

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Materials and Methods

A descriptive cross-sectional study was performed during September 2019 at a school of medicine in Puerto Rico. The participation was voluntary and anonymous, and the data were self-reported. The participants consisted of first-, second-, and third-year medical and nursing students; those who did not meet that criteria were excluded from the study. Fourth-year students were not included since the literature portrays the first 3 years as being the most stressful (11).

The data were collected using the Patient Health Questionnaire (PHQ-9), which is used, internationally, for screening for and diagnosing depression as well as, monitoring and measuring it. This questionnaire has been properly validated and consists of 9 questions (12, 13). The PHQ-9 is a brief, self-report version of the Primary Care Evaluation of Mental Disorders instrument validated and used to assess depression symptoms and their severity in adults in clinical and research settings. It is based on diagnostic criteria found in the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (14). The PHQ-9 is a depression module with 9 depression symptoms that can be checked off if they become the cause of psychological distress. When filling out the questionnaire, the respondents categorized the symptoms of their depression based on frequency, each frequency then being assigned a numeric value. The range of frequencies were the following: not at all (assigned the number 0), several days (1), more than half the days (2), and nearly every day (3). Subsequently, depression severity was determined using a Likert-type scale; scores from 0 to 4 were equated with low to no depression; from 5 to 9, mild depression; from 10 to 14, moderate depression; from 15 to 19, moderately severe depression; and from 20 to 27, severe major depression. We used 5 as a cutoff to be able to include mild depressive symptoms in our evaluation. Because it is a self-administered instrument, the PHQ-9 is considered superior to instruments administered by clinicians, and it is also a reliable and valid measure of depression severity (15). In addition, it is, because of its validity, used widely in both small and large populations. In Puerto Rico, this questionnaire has been used in a clinical setting on a cancer population and, a modified version, with young people (16,17).

A sociodemographic questionnaire containing 20 questions was also distributed to assess additional factors and to have a more complete description of our study participants. Participation was voluntary and confidential. Informed consents and surveys were distributed after exam days, when all the students would convene. Participation was kept as confidential as possible; however, each questionnaire and consent form was assigned a numeric code so that in the event that any student expressed ideas of harm to self or others, confidentiality could be broken. A protocol could be activated for referring that individual to the school's Dean of Student Affairs.

A suicide protocol was implemented whenever ideas of self-harm were reported. The school's counselor received the names of the students who expressed suicidal ideation so that those

students could be counseled and managed accordingly. After this kind of occurrence, the numeric codes that made it possible to identify that specific student would be removed and the data would become completely confidential and ready for analysis. To guarantee the safety of the information collected, the materials were kept locked in the principal investigator's office until the completion of the study. Only this person had access to the room.

Various qualitative and quantitative variables were taken into account in this study. The qualitative variables consisted of the presence of depression symptoms, the year of study, gender, marital status, ethnicity, income bracket, the level of education, religious belief, place of birth (specifically, whether the respondent was a native of Puerto Rico), whether a school year had been repeated, regretting being in medical or nursing school, the presence of chronic disease, the presence of a major life event, cigarette smoking, alcohol intake, the amount of sleep (ranges used in the study: 3–5 hours, 5–7 hours, 7–9 hours, and more than 9 hours of sleep), and the amount of exercise. In terms of quantitative variables, we studied age, the number of household members, and grade point average (GPA).

A statistical analysis was performed using the sociodemographic survey and PHQ-9 responses. All the quantitative variables were analyzed using measures of central tendency and measures of dispersion. For the qualitative variables, a frequency analysis and descriptive statistics were performed. Fischer's exact test with Yates's correction for continuity was used to assess the relationship between depression and the qualitative variables of 2x2 tables, Pearson's chi-square test of independence for R x C tables was used for larger tables, with the CrossTables function of the R package gmodels. The assumptions of the models were evaluated, and when the expected values were lower than those recommended, no test was performed. Simple logistic regression using PHQ-9 scores was done to further describe the statistically significant associations, and the function for logistic regression was the Gaussian or the Poisson distribution, based on the type of data. Hypothesis testing was performed at a 5% level of significance. GraphPad Prism 8 and R were used to conduct the analysis (18). Figures were done with ggplot2 in R (18). Note that, for some analyses, the sample sizes were smaller because some participants did not complete every question.

This study was approved by the Institutional Review Board at the San Juan Bautista School of Medicine (IRB#: EMSJBIRB-9-2019). The principal investigator met with all the students and explained the purpose of the study. Informed consent was obtained at enrollment from the students who agreed to participate.

Results

A total of 173 (83.2%) out of 208 eligible students participated in the study. This study included 131 (out of 160: 81.9%) medical students and 42 (out of 48: 87.5%) nursing students. Of the medical students, 38.9% were in their first year, 38.2% were in their second year, and 22.9% were in their third

year (Table 1). Of the nursing students, 40.5% were in their first year, 30.9% were in their second year, and 28.6% were in their third year (Table 2).

Approximately half the medical students (48.9%) were classified as not having symptoms of depression (based on their PHQ-9 scores), while 35.1% had mild symptoms of depression, 7.6% had moderate symptoms of depression, 6.1% had moderately severe symptoms of depression, and 2.3% had severe symptoms of depression. The PHQ-9 scores had a mean of 5.7 (SD: 4.99; Figure 1A). Approximately half the nursing students (54.8%) were classified as not having symptoms of depression (based on their PHQ-9 scores), while 23.8% had mild symptoms, 9.5% had moderate symptoms, 4.8% had moderately severe symptoms, and 7.1% had severe symptoms. These PHQ-9 scores had a mean of 6.2 (SD: 6.28; Figure 1B). Of the total number of participants, 15 subjects responded yes to the death/self-harm question on the PHQ-9.

Medical students showed no significant relationship between depression symptoms and the following risk factors: year of study, gender, age, marital status, household size, income, highest level of education, ethnicity, religion, place of birth (specifically, whether the respondent was a native of Puerto Rico), GPA, whether or not the respondent had repeated 1 or more years, chronic disease, the presence of a major life event, smoking, alcohol, or exercise (Table 1 and Table 3). Regret about studying medicine was significantly associated with depressive symptoms in the medical-student group. Nursing students showed no significant relationship between depression and the following risk factors: year of study, gender, age, marital status, household size, income, GPA, the presence of a major life event, hours of sleep, and exercise (Table 2 and Table 4). The highest level of education was significantly associated with depressive symptoms within the nursing group. No test was performed for income, ethnicity, religion, or place of birth in the nursing students because of the group's small sample size and because the expected proportion in the group violated the test's assumptions.

All the medical students who indicated they regretted enrolling in medical school and reported sleeping only up to 5 hours a day had a significantly higher frequency on the depression scale than expected. Medical students who regretted enrolling/being in medical school (n = 7) were 2 times more likely to be classified as having depression symptoms than were students who did not regret enrolling/being in medical school (100.0% vs. 47.9%; P = .013). Medical students who expressed regret for having gone into medical school were more likely to be depressed, with an odds ratio (OR) of 1.30 (logistic regression: 95% CI = 1.14 to 1.53, P < .001; Figure 2A). Medical students

Table 1. Demographic variables of the participating medical students and the association of these variables with depression symptoms. The statistical tests are among characteristics of medical students.

Demographic variable	Depression symptoms	No Depression	Statistical test
<i>Year of study</i>			CT = 3.52, P = .17
First year	27	24	
Second year	29	21	
Third year	11	19	
<i>Gender</i>			CTY = 1.24, P = .27
Female	41	32	
Male	26	32	
<i>Age</i>			Mean and SD, P > .48
Female	24.8 (2.9)	25.5 (3.9)	
Male	24.8 (2.6)	24.6 (2.2)	
<i>Marital status</i>			FET < 0.001, P = 1.0
Single/divorced	57	54	
Married/cohabitating	10	9	
<i>Household (number of members in the household)</i>			GLM (Poisson), P = .45
	2.7 (1.4)	2.4 (1.4)	
<i>Household income</i>			CT = 2.1, P = .83
Less than \$9,999	11	14	
\$10,000–19,999	9	9	
\$20,000–49,000	14	16	
\$50,000–99,999	19	15	
\$100,000–149,999	9	5	
More than \$150,000	4	3	
Prefer not to answer	1	2	
<i>Highest Level of Education</i>			CT = 0.72, P = .70
Bachelor's degree	59	54	
Master's degree	6	8	
Professional degree	2	1	
<i>Race/Ethnicity</i>			CT = 1.27, P = .74
Asian/Pacific Islander	2	1	
Hispanic/Latino	60	59	
White	1	4	
Other	4	0	
<i>Religious</i>			CTY = 1.5, P = .23
Religious or spiritual	48	52	
Not religious or spiritual	16	9	
<i>Puerto Rican Native</i>			CTY = 1.29, P = .86
Yes	50	41	
No	16	22	
<i>GPA</i>			Mean and SD, P = .13
	3.44 (0.33)	3.54 (0.28)	

CT = contingency table chi-square test; CTY = contingency table chi-square with Yates's continuity correction test; FET = Fisher's exact test; GLM = general linear model; GPA = grade point average.

who slept up to 5 hours per day (n = 13) were 1.6 times (OR) more likely to be classified as having depression than students who slept at least 5 hours per day (76.9% vs. 48.3%; P = .046). Medical students who reported sleeping up to 5 hours per day were more likely to be depressed (logistic regression: OR = 27.63; 95% CI = 10.53 to 89.82; P = .003; Figure 2B).

All the nursing students who reported having a chronic disease had a significantly higher frequency of depression than was expected. Nursing students who reported having a chronic disease (n = 4) were 2.7 times more likely to be classified as having depression than were those who did not (100.0% vs. 37.1%; P = .029). Nursing students with a chronic disease were more likely to be depressed (logistic regression: OR = 1.21; 95% CI = 1.03 to 1.46; P = .025; Figure 2C).

Table 2. Demographic variables of the participating nursing students and the association of variables with depression symptoms. The statistical tests are of characteristics of student nurses.

Demographic variable	Depression symptoms	Not Depression	Statistical test
<i>Year of study</i>			CT = 0.56, P = .75
First year	7	10	
Second year	7	6	
Third year	5	7	
<i>Gender</i>			CTY = 1.92, P = .16
Female	18	17	
Male	1	6	
<i>Age</i>			Mean and SD, P > .94
Female	20.4 (4.9)	18.9 (1.2)	
Male	-	19.0 (1.5)	
<i>Marital status</i>			FET = 0.75, P = .39
Single/divorced	17	23	
Married/cohabitating	2	0	
<i>Household (number of members in the household)</i>			GLM (Poisson), P = .60
Household	3.9 (1.5)	3.6 (1.1)	
<i>Highest level of Education</i>			CT = 8.2, P = .02
High school diploma	12	20	
Some college credits	6	0	
Bachelor's degree	1	2	
<i>GPA</i>	3.68 (0.27)	3.79 (0.20)	Mean and SD, P = .21

CT = contingency table chi-square test; CTY = contingency table chi-square test with Yates's continuity correction; FET = Fisher's exact test; GLM = general linear model; GPA = grade point average. No test was performed on some of the variables because the expected proportion in the group violated the tests' assumptions.

Discussion

We noted that 51.1% of the medical-student population and 45.2% of the nursing-student population were classified as having mild-to-severe depression symptoms, based on PHQ-9 scores and using a cutoff score of 6. Since our aim in this study was to assess any significant depressive symptoms (regardless of severity), we used the score of 5 as the threshold for the presence of meaningful depressive symptoms. In our cohort, no statistically significant association was found between the

program of study and depression symptoms. Of all the risk factors studied, feelings of regret and lack of sleep were associated with a higher frequency of depression symptoms in medical students. For the nursing-student population, suffering from a chronic disease was associated with a higher frequency of depression symptoms.

Our data portray medical and nursing students as vulnerable populations, as the PHQ-9 scores for depression were high for a large proportion of these participants. The prevalence of depression symptoms in the medical-student group was 1.89 times higher than was the global pooled prevalence among medical students reported in Tam's systematic review (51.1% vs. 27%) (1). Also, the prevalence of depression in the nursing students at this institution was 1.3 times higher than was the global pooled prevalence among nursing students reported in Tung's systematic review (45.2% vs. 34.0%) (2). This difference in the prevalences of depression symptoms among different populations might be explained by our study's cutoff, which was lowered to include mild depression scores of the PHQ-9.

Career dissatisfaction, described as regret for having opted to work in the medical profession, has been shown to be associated with depression and poor performance (both starting as early as the undergraduate level) (19, 20). Some of the causative factors identified are lack of social support, high-stress levels, frequent exams, lack of self-motivation, and lack of interest. At 5.3% (n = 7), the rate of regretting going to medical school was lower than were the rates reported by other studies (19). However, the strong statistical association with depressive symptomatology makes "regret" a potential indicator of depression in medical students.

Furthermore, depression has been proportionally correlated with trouble sleeping. Chronic sleep deprivation has been linked

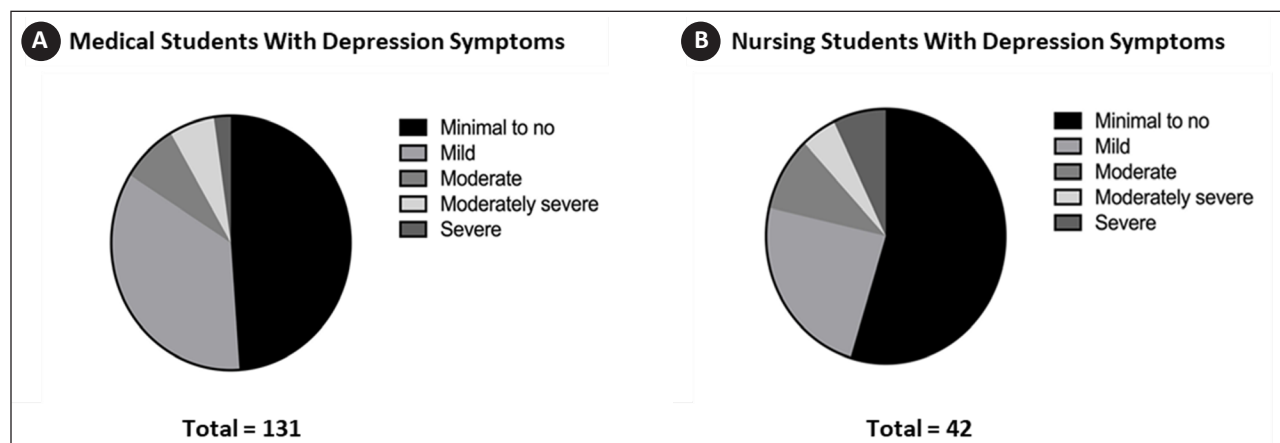


Figure 1. Prevalence of depression symptoms in medical and nursing students: medical students (n = 131) and nursing students (n = 42); classification based on PHQ-9 score. Depression response categories: 0–4 (minimal to no depression), 5–9 (mild depression), 10–14 (moderate depression), 15–19 (moderately severe depression), and 20–27 (severe-major depression).

Table 3. Responses of the participating medical students and the association with likely depression variables.

Demographic variable	Depression symptoms	No Depression	Statistical test
<i>Repeated years</i>			
Yes	2	1	CTY < 0.001, <i>P</i> = 1.00
No	64	62	
<i>Regret school</i>			
Yes	7	6	CTY = 5.25, <i>P</i> = .02
No	57	62	
<i>Chronic disease</i>			
Yes	7	6	CTY < 0.001, <i>P</i> = 1.0
No	58	57	
<i>Smoke</i>			
Yes	1	1	CTY < 0.001, <i>P</i> = 1.00
No	66	63	
<i>Alcohol</i>			
Yes	32	23	CTY = 1.4, <i>P</i> = .23
No	35	41	
<i>Hours of sleep</i>			
Up to 5 hours	10	3	CTY = 2.8, <i>P</i> = .10
At least 5 hours	57	61	
<i>Exercise</i>			
Yes	46	44	CTY < 0.001, <i>P</i> = 1.00
No	21	20	

CTY = contingency table chi-square test with Yates's continuity correction.

Table 4. Responses of the participating nursing students and the association with likely depression variables.

Demographic variables	Depression symptoms	No Depression	Statistical test
<i>Major life event</i>			
Yes	12	16	CTY = 0.01, <i>P</i> = .91
No	7	7	
<i>Hours of sleep</i>			
<5 Hours	4	1	CTY = 3.0, <i>P</i> = .22
5–6 hours	10	13	
8+ hours	5	9	
<i>Exercise</i>			
Yes	8	15	CTY = 1.4, <i>P</i> = .24
No	11	8	

CTY = contingency table chi-square with Yate's continuity correction test. No test was performed on some of the variables because the expected proportion in the group violated the tests' assumptions.

with the desensitization of serotonin-1A receptors, making room for disorders caused by altered serotonergic neurotransmission (21). We found a significant association between reduced sleep and depression symptoms in the participating medical students. The 9.9% (*n* = 13) who reported sleeping only up to 5 hours were 1.6 times more likely to be classified as having depression symptoms than were those who had more rest.

A meta-analysis performed by DeJean et al. evaluated 20 studies focused on the general population and found chronic disease as an aspect that may be either independent from or interrelated with depression, but that may not always be accounted for, as it tends to be difficult for patients to isolate mental health issues from organic problems, due to overlapping symptoms (22). Possible subjectivity notwithstanding, our

study found a significant association between having a history of chronic disease and higher PHQ-9 scores in nursing students.

The limitations to this study include the fact that data acquired through self-report techniques can be subject to recall bias and social desirability bias (23, 24). Furthermore, the protocol for the referral of a participant with thoughts of self-harm may have an effect on that participant's truthfulness when he or she is responding to this particular question. The risk factors studied herein were based on many cross-sectional and longitudinal studies that consistently found them associated with a higher risk of major depressive disorder (25). It is important to acknowledge that our results may reflect low statistical power due to the small sample size. We suspect that because of this, there is a lack of significance behind the correlation of depression symptoms with risk factors that have previously been found to be impactful in similar studies. For example, studies have shown marginal increases in depression in female medical students compared to their male counterparts, but in our study, gender showed no significant relationship with depression (26, 27). Moreover, other studies have shown a significant association between depression and self-reported academic performance, but in our study, self-reported academic performance was not associated with depressive symptoms. These previous studies found that depressed students were more likely than their non-depressed counterparts to have a GPA below 3.0 (28).

Despite these limitations, our study presents novel insights into a topic that has never been explored in a medical- or nursing-student population in Puerto Rico.

Due to the increased risk of depression among healthcare professionals, identifying risk factors that can be addressed through early changes in behavior, or changes in institutional policies, is important in terms of working to mitigate the risk of mental health problems in this already vulnerable population. Some of the strategies that can be implemented are the creation of both support groups with the counselors of the institutions where these populations are studying and a voluntary faculty mentorship program in which the affected students have the opportunity to be assigned to a faculty member for academic and personal support.

Resumen

Objetivo: En Puerto Rico hay escasez de datos sobre salud emocional y depresión en profesionales de la salud, específicamente en estudiantes de medicina y enfermería. El propósito del estudio fue dilucidar la prevalencia de los síntomas

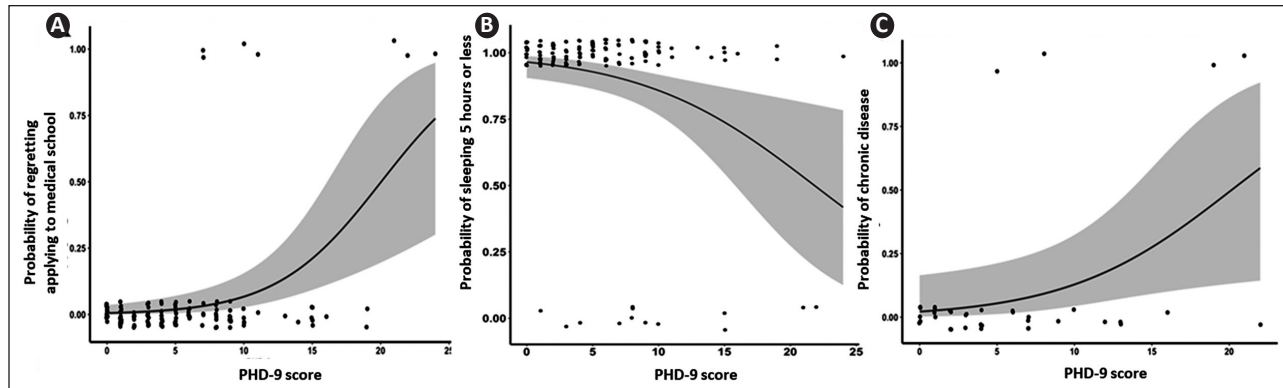


Figure 2. A. Medical students who regretted applying to medical school. Logistic regression analysis curve showing that regret in medical students was significantly associated with high PHQ-9 scores ($P < .001$). B. The probability of sleeping 5 hours or less for medical students. Logistic regression analysis curve showing that sleeping less than 5 hours per day was significantly associated with high PHQ-9 scores in medical students ($P < .003$). The grey area represents the 95% confidence intervals. The data are jittered to reduce data overlapped. C. Logistic regression analysis curve showing that chronic disease in nursing students was significantly associated with high PHQ-9 scores ($P < .025$).

de depresión entre estudiantes de medicina y enfermería en una escuela de medicina en Puerto Rico. Métodos: Se realizó un estudio descriptivo transversal en 2019 en estudiantes de enfermería y medicina en su primer, segundo y tercer año. Para la recolección de datos se utilizó el Cuestionario de Salud del Paciente (PHQ-9, por sus siglas en inglés) y preguntas sociodemográficas. Se realizaron análisis de regresión logística para determinar la asociación de las puntuaciones de PHQ-9 y los factores de riesgo asociados con síntomas depresivos. Resultados: Un total de 173 (83.2%) de los 208 estudiantes matriculados participaron en el estudio. De los participantes, 75.7% eran estudiantes de medicina y 24.3% de enfermería. Entre los factores de riesgo estudiados, los sentimientos de arrepentimiento y la falta de sueño se asociaron con puntuaciones más altas de PHQ-9. En la población de estudiantes de enfermería, el padecimiento de una enfermedad crónica se asoció con una mayor frecuencia de síntomas depresivos. Conclusión: Debido al alto riesgo de síntomas depresivos entre los profesionales de la salud, la identificación temprana de factores que contribuyan al desarrollo de estos síntomas es imperativo para promover cambios en el comportamiento de los profesionales o en las políticas de instituciones de salud para mitigar el riesgo de problemas en la salud mental de esta población.

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