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Depressive symptoms and academic performance in medical students

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Original article

SUMMARY

The prevalence of depression among medical students is significantly higher than that from the general population or other undergraduate students and can result in dropping out, in such a way that the growing number of students who have dropped out due to their poor performance or their vocational indecision could be related to the presence of this condition.

Objective and methodology

To identify if the depressive symptoms presented by first-year medical students were associated with poor performance. The study included 774 first-year undergraduate medical students (66.4% female, 33.6% male, average age: 18.6 ± 1.7 years). The Beck Depression Inventory and the SCL90 (Symptom Checklist) depression subscale were used.

Statistical analysis. Descriptive analyzes were performed, χ^2, Student's t-tests and logistic regression.

Results

The percentage of students with depressive symptoms was 23% (male 12.3%, women 28.4%), with a significant difference in depressive symptoms between female and male medical students (OR=2.8). 68% of students who had depressive symptoms failed a subject, which was a risk of disapproval of 2.4 times compared with those without such symptomatology. The variables sex and depressive symptomatology were found to be factors related to poor academic performance, with an increased risk for students with symptoms (OR=2.2, 95% CI=1.56-3.20).

Conclusions

Depressive symptomatology is an important risk factor for failing a subject or having a poor academic performance.

Key words: Depression, academic performance, medical students.

RESUMEN

La prevalencia de depresión en estudiantes de medicina es significativamente más alta que la presentada en la población general o en estudiantes de otras licenciaturas y puede dar como resultado el abandono de los estudios, de tal manera que el creciente número de estudiantes que han sido dados de baja debido a su mal rendimiento o a sus indecisiones vocacionales pudiera tener relación con la presencia de este padecimiento.

Objetivo y metodología

Identificar si los síntomas depresivos que presentaban los estudiantes de primer año de la licenciatura de Médico Cirujano estaban asociados con un bajo rendimiento. Participaron 774 estudiantes del primer año de la carrera de Médico Cirujano (66.4% mujeres, 33.6% hombres; media de edad: 18.6 ± 1.7 años). Se utilizó el Inventario de Beck para Depresión y la subescala de Depresión del SCL90 (*Symptom Check-List*).

Análisis estadístico. Se realizaron análisis descriptivos, χ^2, *t* de Student y regresión logística.

Resultados

El porcentaje de estudiantes con síntomas depresivos fue de 23% (hombres 12.3%, mujeres 28.4%), con una diferencia significativa en la presencia de síntomas depresivos entre mujeres y hombres estudiantes de medicina (OR=2.8). El 68% de los alumnos que tenían síntomas depresivos reprobaron alguna materia, lo que supuso un mayor riesgo de reprobación de 2.4 veces, comparados con quienes no tenían dicha sintomatología. Las variables sexo y sintomatología depresiva resultaron ser factores relacionados con el bajo rendimiento escolar, con un riesgo mayor para los estudiantes con síntomas (OR=2.2, IC95%=1.56–3.20).

Conclusiones

La sintomatología depresiva es un factor de riesgo importante para reprobar alguna asignatura o tener un bajo rendimiento escolar.

Palabras clave: Depresión, rendimiento escolar, estudiantes de medicina.

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INTRODUCTION

The goal of medical education is graduating professionals having the appropriate knowledge, skills and attitudes to be developed successfully. Throughout the education process some factors are to be considered: workload, ways of performance assessment, curriculum, etc., that could negatively affect their mental health and thus their academic performance.[1]

Several studies have proved that studying the first year of college education may be related to high percentages of psychological morbidity, especially depression, as students are confronted with new stressors.[2-7] Even, researches such as Furr et al. (2001) have reported that depression affects about 50% of university student population, clarifying that there are many factors that could lead to the onset of depressive symptoms on students. The most common are: Low academic performance, social stressors, economic problems and the adjustment inherent in the family-college transition.[8]

On the other hand, several authors have confirmed that depression may cause dropouts. Therefore, the growing number of students who have dropped out due to their poor performance or their vocational indecision could be related to the presence of depression and/or anxiety.[9,10]

Aktekin et al. (2001) reported that the Beck Depression Inventory score from medical students resulted higher than that of students of economics and that such score increased significantly during the second year of the undergraduate studies.[11] For their part, Al-Busaidi et al.[12] (2011) assessed the prevalence of depressive symptoms in 481 college students finding that 27.7% had symptomatology at different levels of intensity, with a higher percentage of women; although there were no statistically significant differences between genders, as those reported by other authors.[13-15]

A systematic review on the prevalence of depression and anxiety on medical students reported a higher prevalence of depression during the first two years of the undergraduate studies, compared to the last few years and to the general population's prevalence.[1]

On the other hand, through the use of screening scales some researchers have reported a prevalence of depression symptoms on first and second-year medical students reaching up to 40%, which would be associated with academic factors such as the load of stress generated by the students competition for obtaining the best grades or academic recognitions, the testing and other methods used related to the effort made to achieve a better academic performance.[13,16]

Regarding the association between academic performance and depression, it has been dealt with in several studies.[16-20] While some authors consider that poor academic performance is the causal or predictor factor of depression,[8,18] others consider that the relationship is inverted, that is to say that the academic performance is affected by dejection.[21,22]

Clark et al. (1988), in their longitudinal four-year study on first and second-year medical students obtained data pointing out to a correlation between depression symptoms (measured with the Beck) and poor academic performance, but only on students who developed serious symptoms (score ≥21).[21]

Yeh et al. (2007) analyzed the correlations between academic achievement and anxiety and depression levels on medical students of the University of Kaohsiung, Taiwan (which recently had modified its curriculum). Results reported that —in general— there was no significant correlation between the academic achievement and anxiety and depression. Nevertheless, when students were divided into score groups, according to the depression intensity, those who with a higher score had a lower academic performance during the first months of the undergraduate studies.[23] On the contrary, Vaidya et al. (2007), correlated the depression symptoms with the academic performance (measured by the grades of the students) not finding statistically significant differences.[16]

Considering the foregoing data, the objective of this research is to identify if the depressive symptoms presented by first-year medical students of the School of Medicine of Universidad Nacional Autónoma de México were associated with poor performance.

Identifying this would enable to conduct interventions for preventive purposes like avoiding, in some students, the risk of failure in the academic field, besides promoting a comprehensive development for them.

MATERIALS AND METHODS

Sampling

From the total amount of first-year medical students of schooling cycle 2009-2010 (N=1081), 83% answered the questionnaires (n=896; 32% male, 68% female), since the application took place during a Medical Psychology class, thus only students who attended that day participated.

The Beck Depression Inventory and the depression subscale of the 90-symptoms (SCL-90) checklist were used in the assessment of the depressive symptoms. The questionnaires application was conducted within the second quarter of the (2009-2010) schooling cycle during the Medical Psychology I class. Participation of students was voluntary, who provided previous informed consent.

For measuring the academic performance the grade average each student obtained was considered based on the departmental exams taken throughout the school year in subjects of Anatomy, Cell and Tissue Biology, Biochemistry and Developmental Biology. Statistical analyses considered the approved/not approved category.*

* The Medical Surgery degree program of UNAM's School of Medicine states that if a subject is not approved in any school year, then the students shall not be entitled to enroll into the following level.

Instruments

Beck Depression Inventory. It is one of the most widely used instruments for measuring the depressive symptoms on adolescents and adults.[24,25] It is a 21-question multiple-choice self-report inventory, with a set of four possible answer choices. One of these choices has to be selected according to how the patient has been feeling in the last week. The total score shall range from 0 to 63. A score greater than or equal to 13 values as a cutoff to identify those cases with possible depression.[26-28]

Symptom checklist (SCL-90). A screening tool to identify the symptoms from different psychopathologies consisting of 90 questions including nine dimensions: somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoia and psychoticism. It has a Likert-type answering form with five scoring levels (0-4). In the validation of the instrument with Mexican population a high internal consistency was found with a Cronbach's Alpha coefficient of all the subscales higher than 0.7.[29,30] For the analysis only the depression subscale with a cutoff greater than or equal to 1.5 was considered.[29]

RESULTS

The Table 1 shows the sex distribution of the studied population.

According to the score obtained in each instrument the participants were classified into two groups: students with no depression symptoms (with values lower than the cutoff of each instrument used) and students with depressive symptomatology and probable depression (cutoff: Beck≥13, depression subscale of the SCL90≥1.5), therefore, the study sample consisted of 774 students (596 with no symptoms and 178 with symptoms within the two instruments), 66.4% female and 33.6% male, with an age average of 18.6 ± 1.7 years. In order to confirm the existence of depressive symptoms students who only reported symptoms on a single instrument were excluded.

Depressive symptoms: 23% (*n*=178) of the studied sample (*n*=774) reported depressive symptoms (in the two instruments) (Table 2).

Table 1. Distribution of the sample according to the presence of symptoms and the number of instruments that resulted positive

	Gender distribution (*N*=896)					
	General		Men		Women	
Classification	Total	%	Total	%	Total	%
No symptoms	596	66.5	228	78.6	368	60.7
With symptoms in:						
1 instruments	122	13.6	30	10.3	92	15.2
2 instruments	178	19.9	32	11.1	146	24.1
Total	896	100.0	290	100.0	606	100.0

When analyzing data by sex statistically significant differences were found between men and women, with a higher percentage of cases with depressive symptomatology in women (p=0.0001), and with a higher risk of 2.8 times ($CI_{\alpha 95\%}$ 1.8–4.3) of having symptoms, compared to men.

Academic performance: The grade average obtained in the departmental exams during the schooling cycle 2009-2010 was considered as the students' academic performance. The comparison of averages between men and women showed that women obtained lower grades than men (p<0.05) (Table 3).

Depressive symptoms and academic performance: Once the grade averages are obtained the relationship between depressive symptoms and academic performance was analyzed (Table 4).

The students with depressive symptomatology had a grade average significantly lower than those who did not have any symptoms (p=0.0001).

The next step of the analysis consisted in dividing the sample into not approved students (those who failed one or more subjects during the assessed period) and approved students. Once this was made the risk of failing and the differences between genders were determined (Tables 5 and 6).

The statistical analysis showed significant differences between genders, with a greater percentage of not approved women (p=0.0001), whom risk was 1.8 times higher than men's risk (Table 5).

On the other hand, when considering the group of students with depressive symptoms it was found that 68% of them had failed, while in the group of students who did

Table 2. Distribution of the sample according to the presence of symptoms

	Gender distribution (*n*=774)									
	General		Men		Women				OR	
Classification	Total	%	Total	%	Total	%	χ^2	p**	(mujeres)	$CI_{\alpha 95}$%
No symptoms	596	77.0	228	87.7	368	71.6	2.52	0.0001	2.8	1.8 - 4.3
With symptoms*	178	23.0	32	12.3	146	28.4				
Total	774	100.0	260	100.0	514	100.0				

* Cutoffs to define probable cases: Beck ≥13, SCL90 (subscale of depression) ≥1.5.
**Comparison between genders.

Table 3. Grade average in the first year of undergraduate studies

	Gender comparison (*n*=774)			
Gender	Total	Mean	*t*	*p*
Men	260	7.49	2.85	0.004
Women	514	7.13		
Total	774			

Table 4. Promedio de calificaciones y síntomas depresivos

	Comparison according to presence of symptoms (*n*=774)			
Classification	Total	Mean	*t*	*p*
No symptoms	596	7.40	4.47	0.0001
With symptoms	178	6.76		
Total	774			

not have symptoms the failure percentage was 46.6%. The differences between both groups showed a 2.4 times higher failure risk on those who had depressive symptoms (Table 6).

Logistic regression model: A logistic regression model was made in order to control the effect of the gender and depressive symptomatology variables in academic performance. Results are shown in Table 7.

The logistic regression caused that the risk for the gender variable —when controlling the effect of the depressive symptomatology— was 1.6 times higher for women compared to men. Furthermore, the OR for those who had a depressive symptomatology was 2.2 times higher compared to their schoolmates with no symptomatology and controlling the effect of the gender variable.

In summary, being a woman and having a depressive symptomatology are risk factors to fail ($p<0.05$). Both are significant variables, although a higher risk for students with depressive symptomatology was observed.

DISCUSSION AND CONCLUSIONS

The gender and the depressive symptomatology were found to be factors related to poor academic performance, with an increased risk for students with symptoms (OR=2.2, 95% CI =1.56-3.20). Accordingly, it is possible to affirm that such symptomatology is an important risk factor to fail or have a low grade average.

The percentage of students with depressive symptomatology found in this study was 23% (men 12.3%, women 28.4%), which agree with other studies conducted in Mexico on medical students, whose percentage of depression assessed with the CES-D was 29.8%[31] and with the Beck Depression Inventory that was 26.9%.[32] On Colombian university students, Arrivillaga et al. (2004), also using the Beck, found a prevalence of 30% of depressive symptomatology.[33] These percentages are higher than those reported in epidemiological studies of the general population in Mexico (4.5%)[34] and in other countries (6.6%).[35] Probably, these differences are related to the type of measuring instruments used, since in this study what was assessed were depressive symptoms (with Beck and SCL-90) and in the epidemiological studies semi-structured interviews were used to prepare the diagnosis.

Gender differences and depressive symptomatology: The results of this work report a significant difference in the presence of depressive symptoms between female and male medical students (OR=2.8 for women), a finding that matches up with the description of other authors,[14,15] in the sense that the proportion of women with depressive symptoms is twice as high compared to men. This can be explained by the several researches mentioned by Essau et al. (2010) who conducted a longitudinal study on 773 depressed adolescents, to investigate gender differences on the development and course of their depression.[15] In their article they discuss that the factors associated with the higher frequency of depression in women are biological such as: Hormonal factors,[36] social factors like childhood adversity,[37] cognitive factors like a tendency to rumination[38] and psychological factors like experiencing other interpersonal stressors.[39] Regarding the latter, in female medical students this could be an important factor since they experience an additional psychological burden related to cultural factors such as facing the teachers' negative attitudes and fulfilling greater family demands and household chores.

Gender differences and academic performance: This research found that women obtained lower grades than men, with a 1.8 times higher failure risk (Table 5). This information coincides with the results of López-Bárcena et al. (2008) who report a higher failure of female first-year undergraduate medical students, compared to their male schoolmates.[40]

Table 5. Approved / Not approved students

	Comparación por sexo (*n*=774)									
	General		Men		Women					
Classification	Total	%	Total	%	Total	%	χ^2	*p**	OR	CI_{95}%
Approved	375	48.4	150	57.7	225	43.8	1.34	0.0001	1.8	1.3 - 2.4
Not approved**	399	51.6	110	42.3	289	56.2				
Total	774	100.0	260	100.0	514	100.0				

* Comparison between genders.
** Includes students who failed one or more subjects.

Table 6. Approved / Not Approved Students

	Comparison According to the Presence of Symptoms (*n*=774)									
	General		No symptoms		With symptoms					
Classification	Total	%	Total	%	Total	%	χ^2	*p***	OR	95% CI
Approved	375	48.4	318	53.4	57	32.0	2.49	0.0001	2.4	1.7 - 3.5
Not Approved*	399	51.6	278	46.6	121	68.0				
Total	774	100.0	596	100.0	178	100.0				

* Includes students who failed one or more subjects.
** Comparison between students with/without symptoms.

Notwithstanding the foregoing, most of the studies report that women in college tend to obtain better grades than men,[41-45] although a great deal of these studies contemplate clinical skills assessments, in contrast to the population assessed in this study, who studied basic subjects. Researchers suggest that the reason of this may be that female students have better study skills than male students or that women work in a more consistent manner and attend classes more often.

Other studies have not found significant differences in grades of male and female students, as shown by the research of three schools of medicine in New Delhi with 1067 men and 1183 women, whose score averages of the final exams were almost the same for both sexes.[46]

An explanation of the above study could be, as some researches suggest, the differences in motivation (understood as the reasons for the implementation of their activities) by factors such as: 1) that men pay more attention to aspects related to their intellectual capacities, while women give priority to other things like social and human aspects; 2) that men perform better on only knowledge-based tests and women perform better on clinic-related tasks, and 3) that women achievements have more to do with factors that take into account people and for men those factors that take into account intellectual capacities.[47-57] In the case of our institution, the assessments during the two first years of the undergraduate studies are mainly focused on theoretical knowledge more than on the development of skills dexterities to be applied in clinical and interpersonal activities. Another factor that could intervene significantly is the higher proportion of depressed women found in this sample.

Depressive symptomatology and academic performance: The percentage of students who failed any subject and who had depressive symptoms was 68%, which represented a 2.4 higher failure risk compared to those who did not have symptoms (Table 6). This coincides with the information reported by other authors in the sense that there is an association between having depressive symptoms and a lower academic performance, this applies to students of several degrees and school levels.[18,58,59]

Likewise, it was found that the grade average of depressive symptomatology students was significantly (p<0.05) lower than the average of students with no symptoms. This result matches up with the result obtained by Myoung et al. (2010) who studied 7357 Korean medical students, and reported that those who had had depressive symptomatology in the first two semesters of the degree also had grade averages significantly lower than their students with no depressive symptomatology.[22]

Another data of this study that coincides with Myoung et al. (2010)'s study relates to the higher failure risk on those who had depression symptoms, controlling other variables like sex, even though in the population of this study there were higher risks than in Korean students population (OR=2.2 vs. 1.8).[22]

The importance of the findings of this study lies in contributing evidences strengthening what other authors point out such as: the excessive workload at medicine school and the need that most students have of proving that they are good students, which may affect their mental health and cause a low academic performance.

Both factors not only affect the students quality of life and their professional and academic performance, but also represent a problem for the University regarding the resources allocated that in most cases shall not be reflected in an increase in the population of prepared physicians available to meet the health demands throughout the country. However, this study has the constraints that the depression diagnosis was not confirmed; only the symptoms were assessed. On the other hand, the type of study does not allow carrying out a follow-up of the changes of the depressive symptoms throughout the school year. Lastly, other sociodemographic variables that could intervene in the results obtained were not considered.

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Table 7. Logistic regression model for the failure variable (*n*=774)

Variable	Category	OR	EE	z	*P*>z	95% CI
Gender	Woman	1.6	0.25	2.83	0.005	1.15 - 2.12
Symptomatology	With symptoms	2.2	0.41	4.39	0.0001	1.56 - 3.20

LR chi^2=33.52 Prob>chi^2=0.0001 Log likelihood=-0.519.36

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