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Consequences of the COVID-19 pandemic on the mental health of medical students

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ABSTRACT

Introduction. Several studies have shown an increased prevalence of anxiety, depression and suicidal ideation in the general population in relation to the COVID-19 pandemic. This prevalence has been shown to be even higher among university students. The aim of the present study is to analyze the psychological impact on medical students at the University of Granada and the possible factors associated with this impact.

Method. A questionnaire was designed in Google Forms with validated scales for anxiety, depression and suicidal ideation, as well as questions about other variables of interest. Data collection took place between March and April 2021. Participation was voluntary and anonymous. Multivariate analysis of the results was performed using logistic regression techniques to control for multiple confounding variables.

Results. A total of 297 responses were received. Of the participants, 215 were women (72.39%). A prevalence of anxiety of 51.18%, 70.03% of depression and 16.84% of suicidal ideation was detected. The main factors associated with a higher degree of psychological morbidity were higher scores on the covid fear scale, the comorbid presence of anxiety and depressive symptoms, a previous history of suicidal ideation, or having consulted a psychiatrist before the pandemic.

Conclusion: The results are consistent with previous studies carried out in other universities at an international level. It would be advisable to conduct further research in other Spanish universities and to set up prevention and psychological support programs for students.

Key words. Anxiety, depression, suicidal ideation, COVID-19, medical students

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CONSECUENCIAS DE LA PANDEMIA COVID-19 EN LA SALUD MENTAL DE LOS ESTUDIANTES DE MEDICINA
RESUMEN

Introducción. Diversos estudios han demostrado un aumento de la prevalencia de ansiedad, depresión e ideación suicida en la población general en relación con la pandemia COVID-19. Esta prevalencia ha mostrado ser todavía mayor en estudiantes universitarios. El objetivo del presente estudio es analizar la repercusión psicológica sobre los estudiantes de Medicina de la Universidad de Granada y los posibles factores asociados a este impacto.

Material y métodos. Se diseñó un cuestionario en formato Google Forms con escalas validadas para ansiedad, depresión e ideación suicida, así como cuestiones sobre otras variables de interés. La recogida de datos se realizó entre marzo y abril 2021. La participación fue voluntaria y anónima. Se realizaron análisis multivariantes de los resultados mediante técnicas de regresión logística para controlar los resultados por múltiples variables de confusión.

Resultados. Un total de 297 respuestas fueron recibidas. De los participantes, 215 eran mujeres (72,39%). Se detectó una prevalencia de ansiedad del 51,18%, 70,03% de depresión y 16,84% de ideación suicida. Los principales factores asociados con un mayor grado de morbilidad psíquica fueron, puntuar más alto en la escala de miedo al covid, la presencia comorbida de síntomas de ansiedad y depresión, tener antecedentes previos de ideación suicida o haber consultado con un psiquiatra antes de la pandemia.

Conclusión. Los resultados son concordantes con los estudios previos realizados en otras universidades a nivel internacional. Sería recomendable realizar nuevas investigaciones en otras universidades españolas e instaurar programas de prevención y de apoyo psicológico a los estudiantes.

Palabras clave. Ansiedad, depresión, ideación suicida, COVID-19, estudiantes de medicina.

Actas Esp Psiquiatr 2023;51(5): 202-15 | ISSN: 1578-2735

INTRODUCTION

The emergence of COVID-19 has brought about a major change in many areas of our lives. As of April 2022, about 509.5 million cases of coronavirus have been reported worldwide and about six million people have died as a result[1,2]. The symptoms of COVID-19 are mainly respiratory in nature, ranging from influenza-like illness to severe cases of respiratory distress[3]. However, it has also been shown to be associated with a considerable psychological impact on the population, largely related to the anxiety and fear it generates in individuals, as well as the restrictions that result from this situation[4]. Already in the past, different stressors have been described in relation to pandemics, such as the unpredictable nature of the disease[5,6], the lack of transparent information from the authorities[7], the imposition of social distancing, the concern for our own health as well as that of the people close to us[5] and the associated large economic losses[8], which seem to be involved in the genesis of this emotional impact.

The disease produced by COVID-19 has been related in several studies to the increase in the incidence and prevalence of different psychiatric disorders both in the general population and in individuals who have overcome the disease, such as post-traumatic stress disorder (PTSD)[9-11], obsessive-compulsive symptoms[12], specific phobias[13], impact on the quality of sleep[14], higher rates of depression, anxiety and stress[15]. This increment has been related to the circumstances associated with such confinement (decrease in physical exercise, increase in the use of electronic devices, feeling of loss of control and cornering), in addition to the fear of contagion, family separation, uncertainty about the progression of the pandemic, economic losses or inaccuracy of information in the initial phases of the crisis[14-18]. Other elements that have also been associated with increased psychiatric disorders in the general population include living alone[19], less family support to rely on[20], greater exposure to social networks[21], or working on the front line in the face of the pandemic[22].

On the other hand, it should be noted that university students have been found to have a higher risk of suffering mental health disorders compared to the general population[23]. This level of stress increases considerably in the case of medical students. This is observed in several studies that show a significant increase in depressive and anxious symptoms and suicidal ideation[24-26]. To this intrinsic susceptibility of medical students, we must add the consequences of a stressor of such magnitude as the COVID-19 pandemic. In previous epidemics due to MERS-CoV and SARS-COV1, a higher level of anxiety in these students has already been observed[27,28].

Most of these investigations on the emotional impact of COVID-19 have been carried out on the general population[4,8,29] or by taking students from other countries, such as China or Jordan, as the study population[7,30,31]. The main objective of the present study is to determine the prevalence of anxious symptoms, depressive symptoms and suicidal ideation among medical students at the University of Granada. Secondary objectives include the study of sociodemographic factors and clinical variables associated with a possible increase in this prevalence, such as fear of Sars-Cov2, the presence of disease risk factors or the practice of habitual physical activity.

METHODS

The authors proposed a cross-sectional observational study. The target population was the undergraduate medical students of the University of Granada (UGR) enrolled during the 2020/2021 academic year, as well as the students graduating in 2020 who were preparing for the national specialty exam. Participation was completely voluntary and without financial compensation. The students were invited to participate in the study by disseminating the questionnaire via telematic means, using various social networks (Facebook, Instagram, WhatsApp). Written informed consent was obtained from all participants before enrolment. The collection of parameters was carried out throughout the months of March and April 2021; these months are outside the UGR exam period, because we did not want students to be in a situation associated with increased anxiety.

The calculation of the minimum sample size was performed taking as reference an estimated anxiety prevalence of 21%, the result of a study previously conducted on university students in Jordan during the COVID-19 pandemic[32]. The result was 255 subjects, with a confidence level of 95% and a precision of 5%. This figure is in agreement with the sample size calculated on the basis of WHO recommendations on minimum sample sizes in a prevalence study[33]. Total number of questionnaires received was 297. The study protocol was approved by the Ethics Committee on Human Research (ECHR) of the University of Granada.

Scales used

Data collection was performed by distributing a 44-item, self-administered, online questionnaire in Google Forms format. This was divided into:

1. Sociodemographic questionnaire (sex, age, academic year, place of residence during the academic year, physical activity, form of teaching received, history of anxiety and/or depression, previous psychiatric consultations).

2. COVID questionnaire (risk factors of the subject or his/her family members, positivity for infection at some time during the pandemic, suffering from the disease, contact with COVID+ persons and economic impact of the pandemic).

3. Use of the Fear of COVID-19 Scale to assess the fear of individuals of COVID-19[34,35]. This scale is composed of 7 Likert-type response items ranging from 1 to 5 (1=I totally disagree, 2=I disagree, 3=I neither agree nor disagree, 4=I agree, 5=I totally agree) that include different statements regarding fear of the virus. The total score is calculated by adding the score of each item and ranges from 7 to 35. The higher the score, the greater the detected fear of Sars-Cov2.

4. Use of the GAD-7[36,37] scale to evaluate clinical anxiety. This scale is composed of 7 Likert-type response items from 0 to 3 (0=Never, 1=Less than half of the days, 2=More than half of the days, 3=Almost every day) that evaluate the symptoms and disability associated with the disorder. For its correction, a total score is obtained from the sum of scores of all items, which can range from 0 to 21. In the original version the authors propose a cut-off point of greater than or equal to 10, which we have used as a reference in this study to consider whether or not a patient had anxiety.

5. Use of the GHQ-12 questionnaire to detect depressive-type psychological morbidity and possible cases of psychiatric disorders in contexts such as primary care or in the general population[38,39]. This questionnaire consists of 12 items, 6 of which are positive and 6 negative. The items are answered on a four-point Likert-type scale (0-1-2-3). The total score is the sum of the values obtained in each of the items. The maximum value that can be obtained on the scale is 36 points and the minimum is zero points. In previous scientific literature, 15 has been used as the cut-off point, a value above which it is considered that there is a significant risk of psychological morbidity, which is the value we have used to classify the patient as depressive.

6. Item 9 of the Beck Depression Inventory (BDI) questionnaire was incorporated to analyze the presence of suicidal ideation. The BDI is a widely used tool for depression screening in the general population. Validated for the Spanish population in 2005[40], it is a self-administered questionnaire with 21 items. Specifically, the item used in our study was number 9, which refers to the presence of suicidal ideation ("Suicidal Thoughts or Wishes": 0=I have no thoughts of killing myself, 1=I have had thoughts of killing myself, but I would not do it, 2=I would want to kill myself, 3=I would kill myself if I had the opportunity to do so). In our study all those who scored more than 0 were considered as having the presence of suicidal ideation.

For the selection of the scales used for the evaluation of anxiety and depression (scales 4, 5 and 6), we used as criteria that they should be valid, easy to answer, self-applied, of short duration and validated in the Spanish population.

Statistical analysis

To describe the distribution of the different socio-demographic variables and other variables of interest, the mean was calculated as a measure of centralization and the standard deviation as a measure of dispersion for quantitative variables. For qualitative variables, absolute values (n) and relative frequencies (%) were used as descriptive elements of the sample.

Statistical analyses were performed using SPSS software (version 24). The socio-demographic variables, as well as the rest of the variables under study, were compared with the prevalence of anxiety, depression and suicidal ideation. The Chi-square test was used for qualitative variables (form of teaching, personal history of risk yes/no, family history of risk yes/no...); while T-Student Test were used for quantitative variables (age, mean GAD-7 score, mean GHQ-12 score...). A binary logistic regression analysis was also performed in which the presence (or not) of anxiety, depression and suicidal ideation were taken as dependent variables. The independent variables used were those for which a statistically significant relationship with each of the dependent variables had previously been found by bivariate analysis. The Hosmer and Lemeshow test was used to ensure the goodness of fit of the logistic regression model. The degree of statistical significance for all hypothesis testing was set at $p<.05$.

RESULTS

The final number of participants in the study was 297 students, of whom 215 were women (72.39%). Most individuals were between 18 and 26 years of age (92.93%) and the academic years with the highest representation in the sample were fifth (22.90%) and sixth (29.63%). The mean age was 22.83. Only 16.50% of the students tested positive for COVID at some time during the period of the pandemic under study, and most suffered from the disease with mild symptoms. With respect to psychiatric history, 60.27% of the students had presented anxious-depressive symptoms at some point in their lives prior to the pandemic. However, only 11.45% had consulted a psychiatrist. Regarding the

Actas Esp Psiquiatr 2023;51(5): 202-15 | ISSN: 1578-2735

prevalence of symptoms, we found that 51.18% had anxiety symptoms, 70.03% had depressive symptoms and 16.84% had suicidal ideation (all these variables are presented in Table 1). Table 2 presents the bivariate analyses of the factors associated with the presence of anxiety, showing that the online training modality, the highest score on the fear of COVID scale and not performing routine physical activity are associated with anxiety, while Table 3 presents the factors associated with symptoms of depression, showing significant differences in female sex, online training modality, higher score on the fear of COVID scale, and having been in contact with patients who have tested positive for COVID.

Regarding the presence of anxiety symptoms, an increase was observed if the subject had previous anxiety symptoms (OR = 3.63; 95% CI = 1.88-7.01; p < 0. 01), if he/she had a higher score on the Fear of COVID-19 Scale (OR = 1.11; 95% CI = 1.04-1.17; p < 0.05) and a higher score on the GHQ-12 scale (OR = 1.27; 95% CI = 1.19-1.35; p <0.01) (see Table 4).

On the other hand, the presence of depressive symptoms was related to the presence of a personal history of previous illness (OR = 3.2; 95% CI = 1.03-9.81; p =0.04), a higher score on the GAD7 questionnaire (OR = 1.61; 95% CI = 1.42-1.82; p < 0. 01), and the presence of concomitant suicidal ideation (OR = 7.58; 95% CI = 1.47-39.1; p = 0.02), while the absence of symptoms was associated with younger age (OR = 0.81; 95% CI = 0.68-0.98; p = 0.03) (see Table 5). Finally, the factors associated with the presence of suicidal ideation were analyzed, finding a significant relationship with personal history of previous illness (OR = 2.48; 95% CI = 1.18-5.2; p = 0.016) and having consulted a psychiatrist before the pandemic (OR = 3.59; 95% CI = 1.55-8.32; p < 0.01) (see Table 6).

DISCUSSION

The main objective of this study was to determine the impact of the COVID-19 pandemic on the mental health of medical students. The result obtained was a prevalence of 51.18% of anxious symptoms, 70.03% of depressive symptoms and 16.84% of suicidal ideation during the period corresponding to the pandemic.

Regarding the prevalence of anxious symptoms, this result is significantly higher than that obtained in the study conducted on Jordanian university students during the pandemic (21.5%)[32]. Although the questionnaire used as a screening instrument was the same, this difference seems to be related to the cut-off point chosen in our study, which is lower than the one used as a reference in that publication. In the Jordanian study, anxiety is defined as a score equal to or higher than 15, which would correspond to a severe level of anxiety. If we were to apply this same criterion to our results, the prevalence of anxiety would be 15.15%. However, the rate obtained is also considerably higher if we compare it with the mean prevalence of anxiety detected in university students of all educational backgrounds during the pandemic in a recent meta-analysis (28%)[31]. This fact may presumably be due to the higher level of demand and stress to which medical students tend to be subjected, which on other occasions has already been shown to be an associated factor[41] and which may have been strongly increased by the situation experienced in recent months. There is also evidence of a directly proportional relationship between the prevalence of anxiety and a higher score on the Fear of COVID-19 Scale, which could also explain this increase.

Likewise, the prevalence of depressive-type symptomatology detected in our sample is notably higher than that observed in the study by Naser et al (38.6%)[32]. Again, part of the discrepancy in results may be due to the use of a more specific tool for the detection of depression in that study. The GHQ-12 scale used in our case is more oriented to reveal psychiatric morbidity in general than to specifically detect depressive disorder. In both cases, the prevalence of anxiety and depression detected in medical students was higher than before the arrival of Covid-19 (33.8% anxiety[25] and 39.1% depression[24].

The rate of suicidal ideation among students is slightly higher than that detected in another spanish study carried out before the pandemic (15.8%)[24].

The secondary objectives were to study the association of different variables of interest to a greater or lesser psychological impact. In this respect, the female sex showed a higher prevalence of both anxiety and depression. These differences coincide with those observed in previous studies carried out both in university students[42] and in the general population[32].

Regarding the academic year, the highest rates of anxiety and depression were detected in fifth and sixth year students, showing a directly proportional relationship between depression and the number of years of study participants. The results of different studies are still contradictory about the relationship between these symptoms and academic year. We found studies conducted in Saudi Arabia[43] and China[44] in which greater symptomatology was observed in higher grades. However, other studies such as the one conducted in Iran[45] showed no significant differences.

Online training was found to be significantly more prevalent among subjects who presented anxious-depressive symptomatology. Previous studies have already shown a

Table 1 Socio-demographic variables and main variables of interest in relation to COVID-19

Variables	n=297 N (%) o Mean (± standard deviation)
Sociodemographic	
Sex	
Male	82 (27,61)
Female	215 (72,29)
Age	22,83 (± 2,912)
Academic course	
First to fourth	97 (32,7)
Fifth to sixth	200 (67,3)
Place of residence during the course	
Living with the family	151 (50,84)
Another modality (residence, apartment...)	146 (49,2)
Predominant form of teaching	
Online	241 (81,14)
On-site	56 (18,86)
Variables related with COVID-19	
Risk personal antecedents	
No	243 (81,48)
Yes	54 (18.2)
Family members with risk pathologies	
Yes	198 (66,67)
No	99 (33,33)
Has been positive for COVID?	
No	248 (83,50)
Yes	49 (16,50)
Asymptomatic	6 (2,02)
Low symptoms (cough, tiredness, general discomfort, headache...)	33 (11,11)
Moderate/severe symptoms (limitation for daily activity)	10 (3,37)
Hospital admission	0 (0)
Living with people with COVID+	
No	231 (77,78)
Yes	66 (22,22)
Contact with patients with COVID+ in the practical classes	
Yes	84 (28,28)
No	54 (18,18)
I did not realize practice class	159 (53,54)
Change in economic income due to COVID	
No	207 (69,70)
Decrease	83 (27,9)
Increase	7 (2,4)
Have you ever had anxiety or depressive symptoms (pre-pandemic)?	
No	118 (39,73)
Yes	179 (60,27)
Have you ever consulted a psychiatrist (pre-pandemic)?	
No	263 (88,55)
Yes	34 (11,45)
Have you engaged in ROUTINE physical activity during the pandemic period?	
No	99 (33,33)
Yes	198 (66,67)
1 time per week	27 (9,09)
Aerobic exercise (jogging, cycling, team sports...)	12 (4,04)
Strength exercise (weights, functional exercise...)	13 (4,38)
Yoga/meditation	2 (0,67)
2-3 times per week	71 (23,91)
Aerobic exercise (jogging, cycling, team sports...)	27 (9,09)
Strength exercise (weights, functional exercise...)	36 (12,12)
Yoga/meditation	8 (2,69)
>3 times per week	100 (33,67)
Aerobic exercise (jogging, cycling, team sports...)	27 (9,09)
Strength exercise (weights, functional exercise...)	781 (23,91)
Yoga/meditation	2 (0,67)
Scales	
Total Score GAD-7	9,61 (±4,76)
Total Score GHQ-12	18,52 (±6,747)
Total Score Fear of Covid	15,87 (±6)

Actas Esp Psiquiatr 2023;51(5): 202-15 | ISSN: 1578-2735

Table 2 Factors associated with the presence of anxiety (GAD≥10 o <10)

	Anxiety Yes (n=152). 51.18% Mean (SD) o n (%)	Anxiety NO (n=145). 48.82% Mean (SD) o n (%)	Statistical test, p value
Sex			
Male	28 (18.4)	54 (37.2)	13.151[2], p<.001
Female	124 (81,6)	91 (62,8)	
Age	22.72 (3.184)	22.96 (2.601)	.716[1], p=.474
Academic course			
- First to fourth	58 (59,8)	39 (40,2)	4,279[2], p=.039
- Fifth to sixth	94 (47)	106 (53)	
Place of residence during the course			
- Living with the family	77 (51,3)	74 (48,3)	.028[2], p=.867
- Another modality (residence, apartment)	74 (50,7)	72 (49,3)	
Predominant form of teaching			
- Online	135 (88.8)	106 (73.1)	11.974[2], p=.001
- On-site	17 (11.2)	39 (26.9)	
Risk personal antecedents			
- No	118 (77.6)	124 (86.1)	3.565[2], p=.059
- Yes	34 (22.4)	20 (13.9)	
Family members with risk pathologies			
- No	45 (29.6)	54 (37.2)	1.947[2], p=.163
- Yes	107 (70.4)	91 (62.8)	
Has been positive for COVID?			
- No	132 (53,2)	116 (46,8)	2.522[2], p=.112
- Yes	20 (40,8)	29 (59,2)	
Living with people with COVID +			
- No	120 (78.9)	111 (76.6)	.246[2], p=.620
- Yes	32 (21.1)	34 (23.4)	
Contact with patients with COVID+ in the practical classes			
- No	120 (78.9)	93 (64.1)	8.024[2], p=.005
- Yes	32 (21.1)	52 (35.9)	
Scale Fear of Covid	17.88 (5.914)	13.77 (5.406)	-6.744[1], p<.001
Economic losses			
- No	103 (67.8)	111 (76.6)	2.847[2], p=.092
- Yes	49 (32.2)	34 (23.4)	
Previous symptoms of anxiety and depressions			
- No	38 (25.0)	80 (55.2)	28.213[2], p<.001
- Yes	114 (75.0)	65 (44.8)	
Previous psychiatric consultations			
- No	133 (87.5)	130 (89.7)	.340[2], p=.560
- Yes	19 (12.5)	15 (10.3)	
Physical routine activity during the pandemic			
- No (n=99, 33.3%)	61 (61,6)	38 (38,4)	6.475[2], p= .011
- Yes (n=198, 66.7%)	91 (46)	107 (54)	

SD= Standard Deviation; p value = statistical significance

1. T-Student Test, 2. Chi-square test

Table 3 Factors associated with the presence of depression (GHQ-12 ≥15 o <15)

	Depression Yes (n= 208). 70.03% Mean (SD) o n (%)	Depression NO (n=89). 29.97% Mean (SD) o n (%)	Statistical Test, p value
Sexo			
- Male	47 (22.6)	35 (39.3)	8.728[2], p=.003
- Female	161 (77.4)	54 (60.7)	
Age	22.56 (2.8)	23.48 (3.0)	2.496[1], p=.013
Academic course			
- First to fourth	76 (78,4)	21 (21,6)	4.748[2], p=.0029
- Fifth to sixth	132 (66)	68 (34)	
Place of residence during the course			
- Living with the family	107 (70.9)	44 (29.1)	1.173[2], p=.752
- Another modality (residence, apartment)	101 (69.2)	45 (30.8)	
Predominant form of teaching			
- Online	177 (85.1)	64 (71.9)	7.083[2], p=.008
- On-site	31 (14.9)	25 (28.1)	
Risk personal antecedents			
- No	164 (67.8)	78 (32.2)	3.974[2], p=.046
- Yes	44 (81.5)	10 (18.5)	
Family members with risk pathologies			
- No	65 (31.3)	34 (38.2)	1.356[2], p=.244
- Yes	143 (68.8)	55 (61.8)	
Has been positive for COVID?			
- No	176 (84.6)	72 (80.9)	.625[2], p=.429
- Yes	32 (15.4)	17 (19.1)	
Living with people with COVID +			
- No	162 (77.9)	69 (77.5)	.005[2], p=.946
- Yes	46 (22.1)	20 (22.5)	
Contact with patients with COVID+ in the practical classes			
- No	157 (75.5)	56 (62.9)	4.847[2], p=.028
- Yes	51 (24.5)	33 (37.1)	
Fear of Covid Scale	16.99 (5.742)	13.26 (4.473)	-6.028[1], p<.001
Economic losses			
- No	144 (69.2)	70 (78.7)	2.747[2], p=0.97
- Yes	64 (30.8)	19 (21.3)	
Previous symptoms of anxiety and depression			
- No	70 (33.7)	48 (53.9)	10.704[2], p=.001
- Yes	138 (66.3)	41 (46.1)	
Previous psychiatric consultations			
- No	184 (88.5)	79 (88.8)	.006[2], p=.940
- Yes	24 (11.5)	10 (11.2)	
Physical routine activity during the pandemic			
- No (n=99, 33.3%)	74 (74.7)	25 (25.3)	1.572[2], p=.210
- Sí (n=198, 66.7%)	134 (67.7)	64 (32.3)	

Footnote. SD: Standard deviation
1. T de *Student test*, 2. Chi-square test.

Actas Esp Psiquiatr 2023;51(5): 202-15 | ISSN: 1578-2735

Table 4 Logistic regression of factors associated with the presence of anxiety symptoms

Variables	Bivariate	OR adjusted	CI 95%	Pearson χ^2	df	*Valor de p*	OR adjusted	CI 95%	Wald χ^2	gl	*P value*
Predominant form of teaching											
Online	OR										
On-site		1.0		11.97	1	0.001	1.0		1.231	1	0.26
		0.342	(0.18–0.64)				0.56	(0.21–1.55)			
Contact with patients with COVID+											
No	CI 95%			8.024	1	0.005	1.0		1.045	1	0.31
Yes		1.0					0.64	(0.27–1.51)			
		0.48	(0.284-0.8)								
Presence of anxiety and depression symptoms previous to the pandemic											
No	Pearson □2			28.21	1	<0.001			14.83	1	**<0.001**
Yes		1.0					1.0				
		3.7	(2.26–6.04)				3.63	(1.89–7)			

	Mean	SD	*P Value*	Adjusted OR	CI 95%	Wald χ^2	gl	*P Value*
Fear of Covid-19 Scale	15.87	6	<0.001	1.11	(1.04–1.178)	10.43	1	**0.001**
GHQ-12 questionnaire	18.52	6.747	<0.001	1.27	(1.19–1.35)	56.8	1	**<0.001**

Nota: In addition to the variables shown in the table, the variables initially included in the logistic regression backward selection procedure were: sex, academic course, physical routine activity during the pandemic, and presence of suicide thoughts. For the logistic regression, the Hosmer-Lemeshow goodness-of-fit test showed that the logistic model was appropriate (χ^2=8.53; df=8; *p*=0.383).

Table 5 Logistic regression of factors associated with the presence of depressive symptoms

Variables	n	%	Bivariate OR	CI 95%	Pearson χ^2	df	*P Value*	Adjusted OR	CI 95%	Wald χ^2	df	*P Value*
Sex					8.728	1	0.003			0.595	1	0.44
Male	47	23	1.0					1.0				
Female	161	77	2.22	(1.3–3.79)				0.734	(0.337–1.6)			
Academic course					4.748	1	0.0029			1.258	1	0.257
First to fourth	76	78	1.0					1.0				
Fifth to sixth	132	66	0.536	(0.31-0.94)				1.84	(0.64–5.26)			
Predominant form of teaching					7.083	1	0.008			0.645	1	0.41
Online	177	85	1.0					1.0				
On-site	33	15	0.448	(0.25–0.82)				0.70	(0.3–1.65)			
Risk personal antecedents of covid					3.974	1	0.046			4.058	1	**0.043**
No	164	68	1.0					1.0				
Yes	44	81	2.093	(1–4.38)				3.19	(1.03–9.81)			
Suicidal ideation					19.316	1	<0.001			5.846	1	**0.016**
No	160	77	1.0					1.0				
Yes	48	23	13.05	(3.1–54.99)				7.58	(1.47–39.15)			
Presence of anxiety and depression symptoms previous to the pandemic					10.704	1	0.001			1.992	1	0.16
No	70	34	1.0					1.0				
Yes	138	66	2.31	(1.391–3.83)				0.58	(0.27–1.24)			
	Mean	**SD**					*P Value*	**Adjusted OR**	**CI 95%**	**Wald χ^2**	**gl**	*P Value*
Age	22.83	2.912					**0.013**	0.815	(0.676–0.983)	4.468	1	**0.032**
GAD 7 Score	9.61	4.76					<0.001	1.61	(1.42–1.83)	53.35	1	**<0.001**

Note: In addition to the variables shown in the table, the variables initially included in the logistic regression backward selection procedure were: Fear Covid-19 scale, and contact with patients with covid 19. For the logistic regression, the Hosmer-Lemeshow goodness-of-fit test showed that the logistic model was appropriate. (χ^2=17.34; df=8; p=0.07).

Actas Esp Psiquiatr 2023;51(5): 202-15 | ISSN: 1578-2735

Table 6 Logistic regression of factors associated with the presence of suicide thoughts

Variables	n	%	Bivariate OR	CI 95%	Pearson χ^2	df	*P value*	Adjusted OR	CI 95%	Wald χ^2	df	*P Value*
Risk personal antecedents for Covid					10.015	1	0.002			5.773	1	**0.016**
No	243	82	1.0					1.0				
Yes	54	18	2.91	(1.47–5.75)				2.48	(1.18–5.203)			
Presence of anxiety and depression symptoms previous to the pandemic					9.774	1	0.002			2.559	1	0.11
No	118		1.0					1.0				
Yes	40		3.108	(1.49–6.49)				1.912	(0.86-4.23)			
	179											
	60											
Previous psychiatric consultations					20.413	1	0.001			8.918	1	**0.003**
No	177	85	1.0					1.0				
Yes	33	15	5.14	(2.39–11.05)				3.594	(1.55–8.32)			
Physical routine activity during the pandemic												
No	99	33	1.0		5.820	1	0.016	1.0		3.355	1	0.067
Yes	198	67	0.47	(0.25–0.88)				0.534	(0.27–1.05)			
	Mean (SD)						*P Value*	**Odds ratio adjusted**	**CI 95%**	**Wald χ^2**	**df**	*P Value*
Fear of Covid-19 Scale	15.87 6						<0.018	1.051	(0.99–1.1.11)	2.767	1	0.096

Footnote: For the logistic regression, the Hosmer-Lemeshow goodness-of-fit test showed that the logistic model was appropriate. (χ^2=4.793; df=8; *p*=0.779).

higher rate of anxiety and depression in students due to the completely virtual training that has been given in many universities during the pandemic. This increase has been related to student dissatisfaction with the methodology employed and the increased workload required of them[46].

If we analyze the influence of contact with Covid-19 patients, we observe that there is a higher prevalence of anxiety and depression in those students who did not have contact with infected individuals. This may be due to a more truthful and direct approach to information and reality about the disease, having found in previous research a higher rate of anxiety in subjects with a lower level of knowledge about it[47].

Fear of Covid-19 also seems to increase the prevalence of anxiety and depression among students. The Fear of COVID scale is being used in many recent investigations of the psychological impact of the pandemic. Many of them have also shown an association between a higher level of fear and higher prevalence of anxiety[48], depression[34] and suicidal ideation[49].

Notably, the prevalence of anxiety and depression was higher in those individuals who had presented these types of symptoms prior to the arrival of Covid-19. An increase in suicidal ideation was also observed in those who had a personal history of the pathologies recorded and if they had consulted a psychiatrist before the pandemic, which indicates that confinement has been especially harmful in those patients with previous vulnerability.

With respect to the routine performance of physical exercise during the pandemic, our study shows a lower rate of anxious symptoms and suicidal ideation among those who undertook this practice. In the literature, multiple studies have related sport with a lower prevalence of anxious-depressive symptomatology[50,51]. These results have continued to be consistent in research conducted during the pandemic. For example, a study conducted on the Brazilian population shows that those individuals who performed at least 30 minutes of physical activity per day had lower rates of anxiety and depression, while sedentary lifestyle was associated with a higher risk of presenting these disorders[52].

Strengths and limitations of the study

There are a number of limitations that should be taken into account in order to make an adequate interpretation of the results of the present study. First, the study was conducted in a single Spanish university, which could limit its external validity and the extrapolation of the results to the general population. Second, the time period evaluated in the different questionnaires is very broad. This includes the entire period corresponding to the most critical phase of the pandemic, during which there have been numerous changes both in the social situation of individuals and in the restrictions established by the government, as well as in the measures imposed by the universities on students. This may have meant variations in the psychological and emotional situation of the students that cannot be assessed in the study.

Another bias to be taken into account is that the method of data collection was self-completed questionnaires completed by the students themselves, which could imply a less objective result and an underestimation by the students of the anxious-depressive symptomatology they present.

Finally, it should be noted that the questionnaire used to assess depressive-type symptomatology is not a diagnostic instrument for depression as such, but rather a tool for assessing psychological morbidity, which makes it less specific.

On the other hand, the sample size of the study should be considered a strength of the study. The final number of participants was greater than the minimum required sample size and the sample size is substantially larger than that found in previous studies. We could also consider as a strength the use of previously validated scales, both in their original version and in the Spanish version, as a tool in the study for the detection of psychiatric disorders and the use of multivariate techniques (such as logistic regression) to adjust the results for multiple confounding variables.

CONCLUSIONS

In conclusion, the pandemic has implied an important emotional and psychological impact among a sample of medical university students, increasing their levels of anxiety and depression, as well as the risk of suicide. They have shown to be subjected to a higher level of stress, which has increased with the situation experienced.

The study of the different factors related to the appearance of these psychiatric disorders, as well as further research in other universities, may allow us to establish prevention mechanisms and psychological support systems for students.

Funding. This research has not received any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Actas Esp Psiquiatr 2023;51(5): 202-15 | ISSN: 1578-2735

Conflict of interest

LGR has been a consultant to or has received honoraria or grants from Janssen-Cilag, Lundbeck, Otsuka, Adamed and Pfizer. Rest of authors report no biomedical financial interests or potential conflicts of interests.

Research involving human participants and/or animals

The study was conducted according to the ethical principles of the Declaration of Helsinki. The study protocol was approved by the Ethics Committee on Human Research (ECHR) of the University of Granada.

Informed consent

Written informed consent was obtained from all participants before enrolment.

References

1. Orús A. Coronavirus: número acumulado mundial de casos 2020-2022 | Statista. [cited 2022 Apr 26]. Available from: https://es.statista.com/estadisticas/1104227/numero-acumulado-de-casos-de-coronavirus-covid-19-en-el-mundo-enero-marzo/

2. Orús A. Coronavirus: muertes en el mundo por continente en 2022 | Statista. [cited 2022 Apr 26]. Available from: https://es.statista.com/estadisticas/1107719/covid19-numero-de-muertes-a-nivel-mundial-por-region/

3. Fu L, Wang B, Yuan T, Chen X, Ao Y, Fitzpatrick T, et al. Clinical characteristics of coronavirus disease 2019 (COVID-19) in China: A systematic review and meta-analysis. J Infect. 2020;80(6):656–65.

4. Banerjee D, Rai M. Social isolation in Covid-19: The impact of loneliness. Int J Soc Psychiatry. 2020;66(6):525–7.

5. Polšek D. Huremović D, editor. Psychiatry of Pandemics: a Mental Health Response to Infection Outbreak. Croat Med J. 2020;61(3):306.

6. Zandifar A, Badrfam R. Iranian mental health during the COVID-19 epidemic. Asian J Psychiatr. 2020;51:101990.

7. Yang H, Bin P, He AJ. Opinions from the epicenter: an online survey of university students in Wuhan amidst the COVID-19 outbreak11. J Chinese Gov. 2020;5(2):234–48.

8. Pfefferbaum B, North CS. Mental Health and the Covid-19 Pandemic. N Engl J Med. 2020;383(6):510–2.

9. Bo HX, Li W, Yang Y, Wang Y, Zhang Q, Cheung T, et al. Posttraumatic stress symptoms and attitude toward crisis mental health services among clinically stable patients with COVID-19 in China. Psychol Med. 2021;51(6):1052–3.

10. Zhang J, Lu H, Zeng H, Zhang S, Du Q, Jiang T, et al. The differential psychological distress of populations affected by the COVID-19 pandemic. Brain Behav Immun. 2020;87:49–50.

11. Fawaz M, Samaha A. COVID-19 quarantine: Post-traumatic stress symptomatology among Lebanese citizens. Int J Soc Psychiatry. 2020;66(7):666–74.

12. Ji G, Wei W, Yue KC, Li H, Shi LJ, Ma JD, et al. Effects of the COVID-19 pandemic on obsessive-compulsive symptoms among university students: Prospective cohort survey study. J Med Internet Res. 2020;22(9):e21915.

13. Liu X, Luo WT, Li Y, Li CN, Hong ZS, Chen HL, et al. Psychological status and behavior changes of the public during the COVID-19 epidemic in China. Infect Dis Poverty. 2020;9(1):58.

14. Gualano MR, Lo Moro G, Voglino G, Bert F, Siliquini R. Effects of COVID-19 lockdown on mental health and sleep disturbances in Italy. Int J Environ Res Public Health. 2020;17(13):1–13.

15. Stanton R, To QG, Khalesi S, Williams SL, Alley SJ, Thwaite TL, et al. Depression, anxiety and stress during COVID-19: Associations with changes in physical activity, sleep, tobacco and alcohol use in Australian adults. Int J Environ Res Public Health. 2020;17(11):1–13.

16. Maunder R, Hunter J, Vincent L, Bennett J, Peladeau N, Leszcz M, et al. The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. CMAJ. 2003;168(10):1245–51.

17. Hawryluck L, Gold WL, Robinson S, Pogorski S, Galea S, Styra R. SARS control and psychological effects of quarantine, Toronto, Canada. Emerg Infect Dis. 2004;10(7):1206–12.

18. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. Lancet. 2020;395(10227):912–20.

19. Cao W, Fang Z, Hou G, Han M, Xu X, Dong J, et al. The psychological impact of the COVID-19 epidemic

on college students in China. Psychiatry Res. 2020;287:112934.

20. Du J, Dong L, Wang T, Yuan C, Fu R, Zhang L, et al. Psychological symptoms among frontline healthcare workers during COVID-19 outbreak in Wuhan. Gen Hosp Psychiatry. 2020;67:144–5.

21. Gao J, Zheng P, Jia Y, Chen H, Mao Y, Chen S, et al. Mental health problems and social media exposure during COVID-19 outbreak. PLoS One. 2020;15(4):e0231924.

22. Lu W, Wang H, Lin Y, Li L. Psychological status of medical workforce during the COVID-19 pandemic: A cross-sectional study. Psychiatry Res. 2020;288:112936.

23. Auerbach RP, Mortier P, Bruffaerts R, Alonso J, Benjet C, Cuijpers P, et al. The WHO world mental health surveys international college student project: Prevalence and distribution of mental disorders. J Abnorm Psychol. 2018;127(7):623–38.

24. Atienza-Carbonell B, Balanzá-Martínez V. Prevalence of depressive symptoms and suicidal ideation among Spanish medical students. Actas Esp Psiquiatr. 2020;48(4):154–62.

25. Quek TTC, Tam WWS, Tran BX, Zhang M, Zhang Z, Ho CSH, et al. The global prevalence of anxiety among medical students: A meta-analysis. Int J Environ Res Public Health. 2019;16(15):2735.

26. Salamero M, Baranda L, Mitjans A, Baillés E, Càmara M, Parramon G, et al. Estudio sobre la salud, estilos de vida y condicionantes académicos de los estudiantes de medicina de Cataluña. Fundación Galatea. 2012.

27. Wong TW, Gao Y, Tam WWS. Anxiety among university students during the SARS epidemic in Hong Kong. Stress Heal. 2007;23(1):31–5.

28. Loh L-C, Ali AM, Ang T-H, Chelliah A. Impact of a spreading epidemic on medical students. Malays J Med Sci. 2006;13(2):30–6.

29. Salari N, Hosseinian-Far A, Jalali R, Vaisi-Raygani A, Rasoulpoor S, Mohammadi M, et al. Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: A systematic review and meta-analysis. Global Health. 2020;16(1):57.

30. Liu J, Zhu Q, Fan W, Makamure J, Zheng C, Wang J. Online Mental Health Survey in a Medical College in China During the COVID-19 Outbreak. Front Psychiatry. 2020;11:459.

31. Lasheras I, Gracia-García P, Lipnicki DM, Bueno-Notivol J, López-Antón R, de la Cámara C, et al. Prevalence of anxiety in medical students during the covid-19 pandemic: A rapid systematic review with meta-analysis. Int J Environ Res Public Health. 2020;17(18):1–12.

32. Naser AY, Dahmash EZ, Al-Rousan R, Alwafi H, Alrawashdeh HM, Ghoul I, et al. Mental health status of the general population, healthcare professionals, and university students during 2019 coronavirus disease outbreak in Jordan: A cross-sectional study. Brain Behav. 2020;10(8):e01730.

33. Lachenbruch PA, Lwanga SK, Lemeshow S. Sample Size Determination in Health Studies: A Practical Manual. J Am Stat Assoc. 1991;86(416):1149.

34. Ahorsu DK, Lin CY, Imani V, Saffari M, Griffiths MD, Pakpour AH. The Fear of COVID-19 Scale: Development and Initial Validation. Int J Ment Health Addict. 2020;1–9.

35. Martínez-Lorca M, Martínez-Lorca A, Criado-Álvarez JJ, Armesilla MDC, Latorre JM. The fear of COVID-19 scale: Validation in spanish university students. Psychiatry Res. 2020;293:113350.

36. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: The GAD-7. Arch Intern Med. 2006;166(10):1092–7.

37. García-Campayo J, Zamorano E, Ruiz MA, Pardo A, Pérez-Páramo M, López-Gómez V, et al. Cultural adaptation into Spanish of the generalized anxiety disorder-7 (GAD-7) scale as a screening tool. Health Qual Life Outcomes. 2010;8:8.

38. Goldberg DP, Williams P. A user's guide to the General Health Questionnaire. Windsor, UK: NFER-Nelson; 1988.

39. Sánchez-López MDP, Dresch V. The 12-item general health questionnaire (GHQ-12): Reliability, external validity and factor structure in the Spanish population. Psicothema. 2008;20(4):839–43.

40. Sanz, Jesús; García-Vera, María Paz; Espinosa, Regina; Fortún, María; Vázquez C. Adaptación española del Inventario para la Depresión de Beck-II (BDI-II): 3 . Propiedades psicométricas en pacientes con trastornos psicológicos. Clínica y salud. 2005;16:121–42.

Actas Esp Psiquiatr 2023;51(5): 202-15 | ISSN: 1578-2735

41. Mosley TH, Perrin SG, Neral SM, Dubbert PM, Grothues CA, Pinto BM. Stress, coping, and well-Being among third-year medical students. Acad Med. 1994;69(9):765–7.

42. Pandey U, Corbett G, Mohan S, Reagu S, Kumar S, Farrell T, et al. Anxiety, Depression and Behavioural Changes in Junior Doctors and Medical Students Associated with the Coronavirus Pandemic: A Cross-Sectional Survey. J Obstet Gynecol India. 2021;71(1):33–7.

43. Al-Faris EA, Irfan F, Van Der Vleuten CPM, Naeem N, Alsalem A, Alamiri N, et al. The prevalence and correlates of depressive symptoms from an Arabian setting: A wake up call. Med Teach. 2012;34 Suppl 1:S32-6.

44. Yang F, Meng H, Chen H, Xu XH, Liu Z, Luo A, et al. Influencing factors of mental health of medical students in China. J Huazhong Univ Sci Technol - Med Sci. 2014;34(3):443–9.

45. Bayati A, Mohammad Beigi A, Mohammad Salehi N. Depression prevalence and related factors in Iranian students. Pakistan J Biol Sci. 2009;12(20):1371–5.

46. Fawaz M, Samaha A. E-learning: Depression, anxiety, and stress symptomatology among Lebanese university students during COVID-19 quarantine. Nurs Forum. 2021;56(1):52–7.

47. Amin F, Sharif S, Saeed R, Durrani N, Jilani D. COVID-19 pandemic- knowledge, perception, anxiety and depression among frontline doctors of Pakistan. BMC Psychiatry. 2020;20(1):459.

48. Mertens G, Gerritsen L, Duijndam S, Salemink E, Engelhard IM. Fear of the coronavirus (COVID-19): Predictors in an online study conducted in March 2020. J Anxiety Disord. 2020;74:102258.

49. Mamun MA, Griffiths MD. First COVID-19 suicide case in Bangladesh due to fear of COVID-19 and xenophobia: Possible suicide prevention strategies. Asian J Psychiatr. 2020;51:102073.

50. Kvam S, Kleppe CL, Nordhus IH, Hovland A. Exercise as a treatment for depression: A meta-analysis. J Affect Disord. 2016;202:67–86.

51. Stonerock GL, Hoffman BM, Smith PJ, Blumenthal JA. Exercise as Treatment for Anxiety: Systematic Review and Analysis. Ann Behav Med. 2015;49(4):542–56.

52. Schuch FB, Bulzing RA, Meyer J, Vancampfort D, Firth J, Stubbs B, et al. Associations of moderate to vigorous physical activity and sedentary behavior with depressive and anxiety symptoms in self-isolating people during the COVID-19 pandemic: A cross-sectional survey in Brazil. Psychiatry Res. 2020;292:113339.