





# Anxiety and depression among nursing students during the COVID-19 lockdown: A cross-sectional correlational study

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## Abstract

**Aims and Objectives:** To determine the prevalence and levels of anxiety and depression symptoms among nursing students during the coronavirus lockdown, and to examine factors associated with higher levels of anxiety and depression on this population.

**Background:** Nursing students deal with diverse stressors during their university lives. Confinement measures during COVID-19 outbreak may have influenced students' mental health and well-being. Anxiety and depression are common among nursing students due to different factors. Evidence relating to anxiety and depression in nursing student population during SARS-CoV-2 pandemic is limited.

**Design:** A cross-sectional descriptive co-relational study during the lockdown due to the coronavirus outbreak in Spain was conducted.

**Methods:** An online questionnaire was developed by using google forms. Sociodemographic characteristics form, and the Spanish version of the Hospital Anxiety and Depression Scale (HADS) were used. Spanish nursing students across the country were enrolled. Data collection was performed between 4 April 2020 and 21 April 2020. A multivariate analysis was performed to determine the association between sociodemographic variables, COVID-19 and HADS scores.

**Results:** 1319 participants were enrolled. The sample was formed by 87.1% female students with a mean age of 22 years (SD  $\pm$  5.677). We found a mean score of  $8.47 \pm 4.104$  on Scale HADS-Anxiety and  $6.80 \pm 2.988$  on HADS-Depression. 31.6% students presented abnormal scores of anxiety symptoms, and only 11.4% participants revealed abnormal scores on HADS-Depression.

**Conclusions:** The reported prevalence of anxiety and depression symptoms on nursing students during the COVID-19 lockdown is 56.4% and 38.2%, respectively. 43.6% of the sample scored normal anxiety levels, and 61.8% obtained normal depression levels. Higher anxiety and depression levels were statistically associated with being

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a first-year student, being a smoker, feeling fear, feeling stress and having any close family member infected.

**Relevance to clinical practice:** These data should be valuable for detection and for further treatment decision of this disorders at the initial stage and could be important to prevent further damages to mental health and promote physical, psychological and well-being among this population.

#### KEYWORDS

anxiety, coronavirus, depression, mental health, nursing students, pandemic, Spain

## 1 | BACKGROUND

In the past decades, the severe respiratory tract infection was widely described in the literature related to severe acute respiratory syndrome coronavirus (SARS-CoV) and the Middle East respiratory syndrome coronavirus (MERS-CoV) outbreaks (Song et al., 2019). In the case of Spain, from 31 January to 2 June 2020, there have been 240,010 confirmed cases and 29,858 deaths related to the COVID-19 (World Health Organization, 2020a).

The current situation regarding coronavirus disease (COVID-19) may lead many countries around the world to a health, social and economic unprecedented situation. Spanish government have declared a State of Emergency over the coronavirus in March 2020. It dictates restrictions to circulations and social or even economic activities (Spanish Government, 2020). Educational institutions have been temporarily closed in an attempt to contain the spread of the COVID-19 pandemic (UNESCO, 2020). This also happened in Spanish Universities, and significant changes have been brought to college students by the COVID-19 (Lee et al., 2021). In the specific case of nursing students, their learning activities were converted into a non-presential model and clinical practices were delayed.

The continuous spread of the epidemic, strict isolation measures and delays reopening schools, colleges, and universities across the countries have influenced populations mental health (Cao et al., 2020; Wathelet et al., 2020). In fact, the mental health of young adults was already a global concern before the COVID-19 outbreak (Wathelet et al., 2020).

Many studies have been published on the prevalence of depression and anxiety symptoms among different population groups during COVID-19 witch overall describe a significantly risen of anxiety disorder symptoms (Ma et al., 2020; Marroquín et al., 2020; Ozamiz-Etxebarria et al., 2020; Picaza Gorrochategi et al., 2020; Vahedian-Azimi et al., 2020), and an increase of the prevalence of depression symptoms (Ettman et al., 2020; Ma et al., 2020; Ozamiz-Etxebarria et al., 2020; Picaza Gorrochategi et al., 2020; Vahedian-Azimi et al., 2020).

High levels of stress, anxiety or depression students may be experienced by undergraduate nursing students (AlFaris et al., 2016; Cheung et al., 2016; Fardin, 2020). Indeed, the authors highlight that their personal well-being, academic performance, communication with patients during clinical practices and also the quality and safety

### What does this paper contribute to the wider global clinical community?

- These data should be valuable for detection and for further treatment decision of this disorders at the initial stage and could be important to prevent further damages to mental health and promote physical, psychological and well-being among this population.
- Evaluation of each case is mandatory in the establishment of the real intensity, duration and symptoms impact in the students' life.
- As suggestion for nursing education, we propose to place greater emphasis on risk situations such as the current pandemic, in nursing students, in the subjects that are included in nursing training. It should help students to develop coping strategies to face future situations.

of the healthcare delivered may be influenced by their emotional well-being.

Nursing students face multiple challenges during their academic lives (Rathnayake & Ekanayaka, 2016). Anxiety and depression are common among nursing students due to different factors (Abu Ruz et al., 2018). The knowledge and understanding of what life events could predispose to the development of mental illness in young ages is important (Moreira de Sousa et al., 2018; Saeed et al., 2018). Thus, substantial levels of stress, anxiety and depressive symptoms among college students have been widely described. With the COVID-19 pandemic nursing students' stress has been intensified. More so than at other times, nursing students are nowadays exposed to the circumstances of nursing in practice, as they are carrying out clinical care for ill patients in conditions of inadequate or lack of resources (Drach-Zahavy et al., 2022).

Students were confined to stay at home, and there was an uncertain regarding to when they could return to school, which may have cause anxiety and depression (Wang & Zhao, 2020). Evidence indicates that nursing students experienced adverse mental symptoms during and after the COVID-19 outbreak (Odriozola-González et al., 2020; Patelarou et al., 2021). Also, the mental effects of COVID-19 may differ between countries and

areas due to discrepancies in the COVID-19 infection and anti-epidemic measures. In this context, there is a lack of evidence regarding mental health problems among Spanish nursing students related to COVID-19 during the lockdown period. Besides, other published studies on Spanish Nursing Students regarding to this topic have been performed in different stages of the pandemic but never during the lockdown period. The recent published study by Mendez-Pinto et al. (2023) indicates an import mental health profile on participants characterised by low levels of anxiety and high levels of depression 3 months after the pandemic declaration by the World Health Organization.

In this context, there is a lack of evidence regarding mental health problems among Spanish nursing students related to COVID-19 during the lockdown period. Very little attention has been paid to this population, and therefore, we believe that the findings of this study could be useful in under and post-graduate nursing education and counselling interventions. In the academic year of reopening, addressing the mental health impact of COVID-19 is going to be a key area for school nurses (McDonald, 2020).

This study aims to determine the prevalence and level of anxiety and depression symptoms among nursing students during COVID-19 lockdown, and to examine factors associated with high levels of anxiety and depression symptoms on this population.

## 2 | METHODS

### 2.1 | Design

A cross-sectional descriptive co-relational study was conducted during Spanish lockdown due to COVID-19 outbreak. The authors adhered to STROBE checklist for observational research. Data collection was performed between 4 April and 21 April 2020.

### 2.2 | Participants

To recruit participants, a snowball sampling technique was used. The survey was disseminated throughout social media and via email. Inclusion criteria were defined as: being an undergraduate or postgraduate nursing student, accepted to participate and fully completed data collection instruments. A sample of 1319 Spanish nursing students was obtained.

### 2.3 | Data collection procedure

After the approval of the Ethical Committee, the link to an online questionnaire developed by using google forms was sent through email and social media. All participants accepted and gave consent previous to participation.

## 2.4 | Measures

The measurements included demographics, COVID-19 related questions, and the Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983).

### 2.4.1 | Sociodemographic data

Participants were asked about sociodemographic information: age, gender, marital status, coexistence, children, dependents, academic year, employment status, health-related professional activity and smoking habits.

### 2.4.2 | COVID-19 related questions

Simple questions (answered Yes/No) based on previous studies and literature review were also included: 'Do you feel fear?', 'Do you feel stress?', 'Have you been infected?', 'Do you have any close family member infected?' and 'Do you have any infected friend?'.

### 2.4.3 | Anxiety and depression

HADS validated version to Spanish population (Herrero et al., 2003) was used to detect anxiety and depression symptoms. According to Terol-Cantero et al. (2015) HADS can be used to detect anxiety and depression symptoms in general population. It is a self-administered tool, with 14 questions, with two subscales, anxiety (HADS-Anxiety) and depression (HADS-Depression), and each one has 7 items pointed on a Likert scale 0–3. The score in each subscale varies from 0 to 21, and higher scores implicate higher levels of anxiety and depression (Cabrera et al., 2015). The study of psychometric characteristics of HADS-Spanish version adapted by Terol et al. (2007) indicates internal consistency coefficients (Cronbach's  $\alpha$ )  $\geq .80$ . HADS allow us to explore how mental health of nursing students was affected during the COVID-19 outbreak, and based on previous studies using HADS, we have established our levels as follows: normal (0–7), borderline (8–10) and abnormal (11–21) (Emons et al., 2019; Silverberg et al., 2019; Weber et al., 2018). We must keep in mind that the use of HADS only allows us to measure the intensity or frequency of present symptoms, and not to make a diagnosis related to actual mood or anxiety disorder (Moreira de Sousa et al., 2018).

## 2.5 | Statistical analyses

A brief descriptive analysis on each collected variable was performed, with position measures such as mean, minimal, maximal or dispersion measures as standard deviation to quantitative variables,

and distribution of absolute and relative frequencies to qualitative variables.

The internal consistence coefficients of HADS-Spanish version for this sample were calculated using Cronbach's  $\alpha$ .

The differences of quantitative variables of two groups were assessed with *t* Student test for independent normal samples. In the case of averages, no normality test were applied because it met the criterion of sufficient sample size in each group. In the case of three or more groups, Bartlett test was applied prior to Kruskal-Wallis to compare the variances.

For groups of three or more, ANOVA test or Kruskal-Wallis test was used according to normality or homoscedasticity hypothesis. Multivariate models were built for anxiety and depression. A level of statistical significance of .05 was defined.

The statistical analysis was performed using R Program (R Development Core Team), version 3.6.0. R Core Team (2020).

## 2.6 | Ethics

Ethical committee approval was obtained from the Ethical Committee of Research of the Principality of Asturias (CeIPA2020.116). Participants were informed about confidentiality and anonymous. Participation was volunteer. Before the data collection, participants were given written information regarding the study and informed consent was asked. Legal and ethical aspects were considered during all research process. The study is in accordance with the Organic Law 3/2018, of 5 December, on the Protection of Personal Data and guarantee of the digital rights (Spanish Government, 2018).

## 3 | RESULTS

### 3.1 | Sample description

A total of 1319 participants were enrolled in this study. Students were recruited from Nursing Universities, in 15 Regions around Spain. The sample was formed by 12.9% male and 87.1% female students. The mean age was 22.33 years ( $SD \pm 5.677$ ). The majority of respondents were undergraduate nursing students; only 2.0% were master students. Table 1 presents sample description.

### 3.2 | HADS scores

The alpha Cronbach value of HADS-Spanish version for the sample under study is of .78. In this study, we found a mean score of  $8.47 \pm 4.104$  with a median of 8.00 on HADS-Anxiety subscale, mean of  $6.80 \pm 2.988$  and a median of 7.00 on HADS-Depression subscale.

Regarding to anxiety and depression symptoms prevalence, 38.2% of the students presented HADS-Depression scores corresponding to borderline or abnormal depression symptoms. Higher

TABLE 1 Sample description.

Variable	n (%)
Gender	
Female	1149 (87.1)
Male	170 (12.9)
Academic year	
First	243 (18.4)
Second	333 (25.2)
Third	343 (26.0)
Fourth	374 (28.4)
Masters	26 (2.0)
Marital status	
Single	1157 (87.7)
Married	152 (11.5)
Divorced/widow/separated	10 (0.8)
Coexistence	
Parents/grandparents	1033 (78.3)
Friends	82 (6.2)
Alone	52 (3.9)
Other	152 (11.5)
Children	
No	1270 (96.3)
Yes	49 (3.7)
Dependents	
No	1264 (95.8)
Yes	55 (4.2)
Employment status	
Studying only	1031 (78.2)
Working	227 (17.2)
Unemployed	61 (4.6)
Health-related job	
No	1122 (84.3)
Yes	197 (14.9)
Smoking habits	
No	1130 (85.7)
Yes	179 (14.3)
Do you feel stress?	
No	307 (23.28)
Yes	1012 (76.72)
Do you feel fear?	
No	774 (58.7)
Yes	545 (41.3)
Have you been infected?	
No	1266 (96.0)
Yes	53 (4.0)
Do you have any close family member infected?	
No	1039 (78.8)
Yes	280 (21.2)
Do you have any friend infected?	
No	949 (71.9)
Yes	370 (28.1)

TABLE 2 Distribution of HADS-Anxiety and HADS-Depression levels.

Levels	HADS-Anxiety		HADS-Depression	
	Frequency	%	Frequency	%
Normal (0-7)	575	43.6	815	61.8
Borderline (8-10)	327	24.8	353	26.8
Abnormal (11-21)	417	31.6	150	11.4

prevalence was found on HADS-Anxiety scale, where 56.4% of the participants revealed scores corresponding to borderline or abnormal symptoms. Table 2 represents the anxiety and depression levels assessed with HADS.

### 3.3 | HADS correlational analyses

The relationship between means on HADS-Anxiety and HADS-Depression with the independent variables was analysed. Statistically significant differences were found between both with HADS-Anxiety and HADS-Depression and the following variables: academic year, smoking habits, 'Do you feel fear?', 'Do you feel stress?', 'Do you have any infected friend?' For the remain variables, there was not found any significant association. On the contrary, an association was identified between HADS-Depression mean score and academic year, smoking habits, 'Do you feel stress?', 'Do you feel fear?', and 'Do you have any infected friend?'. Table 3 summarises all the statistically significant associations found.

### 3.4 | HADS-Anxiety and HADS-Depression models

Multivariate linear models are built, including all the possible predictor variables: sociodemographic variables and COVID-19 related questions.

Regarding to anxiety symptoms, in the model once simplified, the following factors are associated with an increased HADS-Anxiety score: having a health-related job, smoking, feeling fear, feeling stress and having some infected friend or family member. Although the 'having dependents' variable does not reach statistical significance, it is maintained because it is very close to the level of significance (Table 4). The linear model is adequate ( $p < .001$ ) obtaining an adjusted  $R^2$  of 36.91%.

In the case of depression symptoms, the final model allows to conclude that being a smoker, feeling fear, feeling stress and being studying only, increases HADS-Depression score (significantly increases being single, studying about being active), while having an infected family member or close friend remain in the model despite not reach statistical significance (Table 5). The model linear is adequate ( $p < .001$ ) while the power explanatory of the model descends with an  $R^2$  adjusted of 14.98%.

## 4 | DISCUSSION

Our study aimed to describe the prevalence of anxiety and depression symptoms among Spanish nursing students during COVID-19 outbreak. The findings indicate borderline and high HADS-Anxiety scores in undergraduate nursing students, with prevalence of 24.8% and 31.6%, respectively. Regarding to HADS-Depression, data analyses reveal a prevalence of 26.8% borderline depression symptoms and a prevalence of 11.4% abnormal depression symptoms. There are similar studies reporting high prevalence of anxiety and depression symptoms in Nursing students using also HADS. For instance, a study on 103 nursing students performed in Japan found a prevalence of anxiety of 30.5% and depressive symptoms of 31.1% (Sakai et al., 2022).

A recent review showed that COVID-19 has caused several psychological impacts, including increased anxiety (Fardin, 2020).

Similar results regarding anxiety were found in other studies. In a study performed on health sciences students, anxiety and depression were found to be highly prevalent among undergraduate students (Rehmani et al., 2018). In a recent work, results indicate that around 24.9% of college students experienced anxiety regarding COVID-19 outbreak (Cao et al., 2020). On the study of Savitsky et al. (2020) on 244 nursing students during COVID-19 lockdown in Israel, moderate anxiety was found in 42.8% of the participants and the prevalence of severe anxiety was 18.1%. In United States, a survey on 50 nursing undergraduate nursing students during the pandemic indicates that 80% revealed anxiety (Fitzgerald & Konrad, 2021).

The study of Rathnayake and Ekanayaka (2016) on a sample of 92 undergraduate nursing students in Sri Lanka reveals higher depression and anxiety prevalence than we have found in our work, with moderate to high severe depression and anxiety in 39.1% and 50.0%, respectively. Findings of a recent study indicate that anxiety on nursing students might be associated with some special factors as moving to remote learning and the perceived loss of support mechanisms (Wallace et al., 2021).

A statistically significant association was found between HADS-Anxiety mean score and gender, academic year, having dependents on charge, health-related job, smoking habits, feeling stress, feeling fear, have been infected, have an infected close family member or have an infected friend. Respect to gender, similar association was found in a study of Moreira de Sousa et al. (2018) on 750 Portuguese medical and non-medical college students. Another work indicates that Israeli male students had significantly lower anxiety scores in comparison with females (Savitsky et al., 2020). Like in our study, these numbers suggest that female students may be more affected by symptoms of anxiety than male students. Prevalence rates found other studies suggest elevated risk of mental health problems in female students (Ibrahim & Abdelreheem, 2015; Jenkins et al., 2021). Also, data from a study to detect the prevalence of anxiety, depression symptoms among frontline HCWs reported that being females and nurse were indicator of more depression and anxiety and stress compared to male (Oteir et al., 2022).

More than 76% (1012) of the participants self-reported feeling stressed presenting high borderline HADS-Anxiety mean (9.56). Many stressors have already been identified in young adults and

	N	HADS-Anxiety			HADS-Depression		
		Mean	SD	<i>p</i>	Mean	SD	<i>p</i>
Academic year							
First	243	9.06	4.23	.03 <sup>a</sup>	7.24	2.90	<b>.001<sup>b</sup></b>
Second	333	8.64	3.98		7.07	3.18	
Third	343	8.00	4.28		6.41	2.85	
Fourth	374	8.39	3.95		6.69	2.95	
Masters	26	7.96	3.70		6.00	2.91	
Gender							
Male	170	7.26	4.27	<.001 <sup>c</sup>	6.51	3.10	.177 <sup>c</sup>
Female	1149	8.64	4.05		6.84	2.97	
Dependents							
No	1264	8.39	4.09	.001 <sup>c</sup>	6.77	2.99	.097 <sup>c</sup>
Yes	55	10.22	4.17		7.45	2.81	
Health-related job							
No	1122	8.36	4.12	.024 <sup>c</sup>	6.79	2.98	.673 <sup>c</sup>
Yes	197	9.08	3.98		6.88	3.02	
Smoking habits							
No	1130	8.34	4.08	.005 <sup>c</sup>	6.66	2.91	<b>&lt;.001<sup>d</sup></b>
Yes	188	9.24	4.17		7.67	3.28	
'Do you feel fear?'							
No	774	6.96	3.60	<.001 <sup>c</sup>	6.10	2.83	<b>&lt;.001<sup>c</sup></b>
Yes	545	10.60	3.82		7.80	2.93	
'Do you feel stress?'							
No	307	4.77	2.73	<b>&lt;.001<sup>d</sup></b>	5.17	2.25	<b>&lt;.001<sup>d</sup></b>
Yes	1012	9.56	3.78		7.30	3.01	
'Were you infected?'							
No	1266	8.42	4.07	<b>.036<sup>c</sup></b>	6.77	2.98	.057 <sup>c</sup>
Yes	53	9.62	4.70		7.57	3.05	
'Do you have any close family member infected?'							
No	1039	8.19	4.04	<b>.001<sup>c</sup></b>	6.73	2.96	.096 <sup>c</sup>
Yes	280	9.49	4.16		7.06	3.08	
'Do you have any infected friend?'							
No	949	8.06	4.02	<.001 <sup>c</sup>	6.66	2.98	<b>.005<sup>c</sup></b>
Yes	370	9.50	4.15		7.17	2.99	

Note: For the construction of Table 3 and taking into account that the sample size in each compared group is greater than 30, parametric tests have been used. Since it is a comparison of means, the central limit theorem allows us to ensure the fit to the normal distribution and therefore the use of parametric tests.

Statistical values are in bold.

<sup>a</sup>Variance analyses test.

<sup>b</sup>Kruskal–Wallis test.

<sup>c</sup>Student *t* test.

<sup>d</sup>Welch test.

in college students. Roy et al. (2020) stated that the uncertainty is an identified stressor in students. Feeling the current situation as stressful can generate a direct impact on students' well-being with several consequences (Suarez-Garcia et al., 2018).

Feeling fear was associated with high HADS-Anxiety mean. A cross-sectional study among nursing students during COVID-19 pandemic revealed that anxiety and fear of COVID-19 levels were high (Kuru Alici & Ozturk Copur, 2022).

TABLE 3 Relationship between HADS-Anxiety and HADS-Depression means and independent variables.

TABLE 4 HADS-Anxiety simplified model.

Simplified	Coefficient	p-Value
Constant	3.855	<.001
Dependents: Yes	0.823	.072
Smoking: Yes	.0561	.0031
'Do you feel fear?': Yes	2.656	<.001
'Do you feel stress?': Yes	3.959	<.001
'Do you have any close family member infected?': Yes	.639	.005
'Do you have any infected friend?': Yes	.840	<.001

TABLE 5 HADS-Depression simplified model.

Simplified	Coefficient	p-Value
Constant	4.377	<.001
Employment status: Unemployed	0.757	.060
Employment status: Studying only	.417	.047
Smoking: Yes	.889	<.001
'Do you feel fear?': Yes	1.272	<.001
'Do you feel stress?': Yes	1.710,959	<.001
'Have you been infected?': Yes	.610	.124
'Do you have any infected friend?': Yes	.320	.068

According to Roy et al. (2020) as COVID-19 is a new disease, causing devastating effects globally, anxiety and fear are also common symptoms among the general public. In their study, 41% of the participants affirmed feeling scared when someone in their social circle became sick.

On one hand, have been infected and having any close family member infected were statistically significant associated with HADS-Anxiety subscale. On the other hand, having infected friends was associated both to HADS-Anxiety and HADS-Depression scales. These results may have a relationship with the awareness of the high contagiousness characteristics of the novel coronavirus (Song et al., 2019; World Health Organization, 2020b). Our results are consistent with Cao et al. (2020) who found that having relatives or acquaintances being infected with COVID-19 was identified as an independent risk factor in college students' anxiety about the epidemic. No many studies were found that could help us to justify our results related to 'have been infected' and HADS-Anxiety and HADS-Depression means present in our sample. In the study of Roy et al. (2020), despite participants were not infected with COVID-19, an increased need for mental healthcare was detected. Study authors justify it affirming that individuals, who are infected with COVID-19 or suspected of having it, are expected to have more compromised mental health and higher perceived mental healthcare needs. Also, it has been described that many nurses have concerns about their work and its impact on them personally (Fernandez et al., 2020). The risk of being infected, transmission to family members, stigma about the vulnerabilities of their job and restrictions on personal freedom have been particularly reported as key concerns (Chiang et al., 2007; Hope et al., 2021; Seale et al., 2009).

Although our data did not reveal a statistically significant difference between higher HADS-Anxiety scores and coexistence, other studies have shown that association. A study on college students in China, living with parents was a favourable factor against feeling anxious (Cao et al., 2020). In addition, previous studies have indicated not living with parents as a risk factor associated with emotional and anxiety disorders in adults (Gentili et al., 2020; Woodgate et al., 2020).

Regarding to academic year, our results indicate that first-year students are those who present higher HADS-Anxiety mean score. A study among students, faculty members and academic staff from a Spanish University indicates that undergraduate students at the sixth year of their studies (which include only medicine students) presented significant lower depression and stress scores compared to first year students, and significant lower depression scores were also found for fourth year students with respect to first year (Odriozola-González et al., 2020). Indeed, students from the early years of university appear to be affected to a greater extent than those in more advanced courses.

Being recently in a new career, related to the health area and in a state of alarm could be related to their high levels. Furthermore, we believe that concern with the future, having fewer psychological and coping resources, a lower level of knowledge, less experience in clinical practices, may also contribute to these results. They have a lot of impact overall. We can infer that this new situation supposes much more fear and anxiety in a student than it supposes to a first-line health worker in the fight against this new virus. In addition, fourth year students are whom most (28.35%) reveal borderline HADS-Anxiety symptoms (7–10). High HADS-Anxiety scores in last year course (fourth) may be related to academic level demanding, and with coming responsibilities and concerns as junior nurses. Also, in our study, in order to explain the HADS-Anxiety means and academic year, it is important to highlight that the restructuring of academic activities especially the clinical practices for last year students could mean a delay on the graduation date, and a consequent later entry on the working market for those students. In a study with 7143 college students, the authors mentioned that results of correlation analysis ( $p < .001$ ) indicated that delays in academic activities were positively associated with anxiety symptoms (Cao et al., 2020). On the contrary, in the study of Savitsky et al. (2020) academic year was not found associated with anxiety.

Regarding HADS-Depression scale, a statistically significant association was found between it and academic year, smoking habits, feeling stress, feeling fear and having an infected friend. Even though statistically significant differences were found, the average falls within 'normal' categorical values (HADS-Depression <7), excepting academic year variable. First year students present high mean on HADS-Depression. The justification and interpretation about reasons for these results can be transposed from HADS-Anxiety results discussion. For the remain association, we so do not think it would be advisable to look at these data. Another study with first-year nursing students, authors have established an association

between younger ages and higher levels of depression (Christensson et al., 2011).

Current global changes like isolation, social distancing, self-quarantine and restriction of travel are likely to affect mental health adversely (Banerjee, 2020).

#### 4.1 | Study limitations

As major limitation of our study, being a descriptive and cross-sectional study, it may limit our data generalisation. However, given the current situation of pandemics we believe it was the best methodologic option to perform this study.

Another limitation is that the data are already a little outdated. Nevertheless, regarding to this specific topic on this population our results bring some new knowledge and evidence that should be taking into account when planning psychological interventions and support to college students. Nursing students during the lockdown period presented a psychological status that differs from the furthers periods, as during the second wave, where instead of high anxiety levels, students revealed high depression levels.

#### 4.2 | Implications for future research

- For future research, it would be interesting to establish the association between mental health and quality of life in this population. In order to establish the real intensity, duration and symptoms impact in the students' life, to future research, it could be useful to repeat the same assessment at least 6 months after the COVID-19 lockdown.
- It would be interesting to describe and to assess whether the academic learning environments have implemented mechanisms to support and to improve the emotional well-being and psychological resiliency of students. It is necessary to define paths in order to facilitate the accessibility of support, counselling and mental health resources to nursing students, and also to know the impact on their mental health.
- An exploratory study should be conducted to describe the effect of the development of new guidelines for online counselling and psychological interventions designed for specific groups such as health workers and nursing students during the initial phase of the pandemic.

#### 4.3 | Linking evidence to action

- These data should be valuable for detection and for further treatment decision of this disorders at the initial stage and could be important to prevent further damages to mental health and promote physical, psychological and well-being among this population.

- Evaluation of each case is mandatory in the establishment of the real intensity, duration and symptoms impact in the students' life.
- As suggestion for nursing education, we propose to place greater emphasis on risk situations such as the current pandemic, in nursing students, in the subjects that are included in nursing training. It should help students to develop coping strategies to face future situations.

### 5 | CONCLUSIONS

The reported prevalence of anxiety and depression symptoms on nursing students during the COVID-19 lockdown is 56.4% and 38.24%, respectively. Most of Spanish nursing students revealed borderline and high HADS-Anxiety scores during the COVID-19 lockdown. Regarding to HADS-Depression, in more than a third of the sample were identified borderline or abnormal depression symptoms.

An association was detected between higher HADS-Anxiety score and being a first year student, female gender, having dependents, having a health-related job, being a smoker, feeling fear, feeling stress, having been infected and having any close family member infected. Regarding to HADS-Depression scale, a statistically significant association was found between higher means scores and being a first year student, being a smoker, feeling stress, feeling fear, having any close family member infected and having any friend infected.

The real impact of the current pandemic situation on nursing students is a major importance topic for nursing. Current nursing students are going to be tomorrow nursing professionals, and their mental health needs must be assessed and addressed. For that reason, this article is a first step to know the level of anxiety and depression due to the COVID-19 on a specific population of nursing students. Programs to support individuals can be design based upon on the found results.

#### AUTHOR CONTRIBUTIONS

Maria-Pilar Mosteiro-Diaz: Conceptualization, Methodology, Data curation, Formal analysis, Writing-Original draft, Writing-Reviewing and Editing, Supervision. Patricia Campos Pavan Baptista: Writing-Reviewing. Aida Gamez-Fernandez: Data curation, Writing-Original draft preparation. Carmen Baldonado-Mosteiro: Conceptualization, Methodology, Writing-Original draft preparation, Data curation. Sara Franco-Correia: Data curation, Formal analysis, Writing-Reviewing and Editing.

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#### CONFLICT OF INTEREST STATEMENT

No conflict of interest has been declared by the authors.



## DATA AVAILABILITY STATEMENT

Due to the sensitive nature of the questions asked in this study, survey respondents were assured raw data would remain confidential and would not be shared.

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## REFERENCES

- Abu Ruz, M. E., Al-Akash, H. Y., & Jarrah, S. (2018). Persistent (anxiety and depression) affected academic achievement and absenteeism in nursing students. *The Open Nursing Journal*, 12(1), 171–179. <https://doi.org/10.2174/1874434601812010171>
- AlFaris, E., Irfan, F., Qureshi, R., Naeem, N., Alshomrani, A., Ponnampuruma, G., Al Yousufi, N., Al Maflehi, N., Al Naami, M., Jamal, A., & van der Vleuten, C. (2016). Health professions' students have an alarming prevalence of depressive symptoms: Exploration of the associated factors. *BMC Medical Education*, 16(1), 279. <https://doi.org/10.1186/s12909-016-0794-y>
- Banerjee, D. (2020). The COVID-19 outbreak: Crucial role the psychiatrists can play. *Asian Journal of Psychiatry*, 50, 102014. <https://doi.org/10.1016/j.ajp.2020.102014>
- Cabrera, V., Martín-Aragón, M., Terol, M., Núñez, R., & Pastor, M. (2015). Hospital anxiety and depression scale (HADS) in fibromyalgia: Sensitivity and specificity analysis. *Terapia Psicológica*, 33(2), 181–193. <https://doi.org/10.4067/S0718-4808201500300003>
- Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Research*, 287, 112934. <https://doi.org/10.1016/j.psychres.2020.112934>
- Cheung, T., Wong, S. Y., Wong, K. Y., Law, L. Y., Ng, K., Tong, M. T., Wong, K. Y., Ng, M. Y., & Yip, P. S. (2016). Depression, anxiety and symptoms of stress among baccalaureate nursing students in Hong Kong: A cross-sectional study. *International Journal of Environmental Research and Public Health*, 13(8), 779. <https://doi.org/10.3390/ijerph13080779>
- Chiang, H. H., Chen, M. B., & Sue, I. L. (2007). Self-state of nurses in caring for SARS survivors. *Nursing Ethics*, 14(1), 18–26. <https://doi.org/10.1177/0969733007071353>
- Christensson, A., Vaez, M., Dickman, P. W., & Runeson, B. (2011). Self-reported depression in first-year nursing students in relation to socio-demographic and educational factors: A nationwide cross-sectional study in Sweden. *Social Psychiatry and Psychiatric Epidemiology*, 46(4), 299–310. <https://doi.org/10.1007/s00127-010-0198-y>
- Drach-Zahavy, A., Goldblatt, H., Admi, H., Blau, A., Ohana, I., & Itzhaki, M. (2022). A multi-level examination of nursing students' resilience in the face of the COVID-19 outbreak: A cross-sectional design. *Journal of Advanced Nursing*, 78(1), 109–120. <https://doi.org/10.1111/jan.14951>
- Emons, W. H., Habibović, M., & Pedersen, S. S. (2019). Prevalence of anxiety in patients with an implantable cardioverter defibrillator: Measurement equivalence of the HADS-A and the STAI-S. *Quality of Life Research*, 28(11), 3107–3116. <https://doi.org/10.1007/s11136-019-02237-2>
- Ettman, C. K., Abdalla, S. M., Cohen, G. H., Sampson, L., Vivier, P. M., & Galea, S. (2020). Prevalence of depression symptoms in US adults before and during the COVID-19 pandemic. *JAMA Network Open*, 3(9), e2019686. <https://doi.org/10.1001/jamanetworkopen.2020.19686>
- Fardin, M. A. (2020). COVID-19 and anxiety: A review of psychological impacts of infectious disease outbreaks. *Archives of Clinical Infectious Diseases*, 15(COVID-19). <https://doi.org/10.5812/archcid.102779>
- Fernandez, R., Lord, H., Halcomb, E., Moxham, L., Middleton, R., Alananzeh, I., & Ellwood, L. (2020). Implications for COVID-19: A systematic review of nurses' experiences of working in acute care hospital settings during a respiratory pandemic. *International Journal of Nursing Studies*, 111, 103637. <https://doi.org/10.1016/j.ijnurstu.2020.103637>
- Fitzgerald, A., & Konrad, S. (2021). Transition in learning during COVID-19: Student nurse anxiety, stress, and resource support. *Nursing Forum*, 56(2), 298–304. <https://doi.org/10.1111/nuf.12547>
- Gentili, D., Bardin, A., Ros, E., Piovesan, C., Ramigni, M., Dalmanzio, M., Dettori, M., Filia, A., & Cinquetti, S. (2020). Impact of communication measures implemented during a school tuberculosis outbreak on risk perception among parents and school staff, Italy, 2019. *International Journal of Environmental Research and Public Health*, 17(3), 911. <https://doi.org/10.3390/ijerph17030911>
- Herrero, M. J., Blanch, J., Peri, J. M., De Pablo, J., Pintor, L., & Bulbena, A. (2003). A validation study of the hospital anxiety and depression scale (HADS) in a Spanish population. *General Hosp Psychiatry*, 25(4), 277–283. [https://doi.org/10.1016/S0163-8343\(03\)00043-4](https://doi.org/10.1016/S0163-8343(03)00043-4)
- Hope, K., Massey, P. D., Osbourn, M., Durrheim, D. N., Kewlwy, C. D., & Turner, C. (2021). Senior clinical nurses effectively contribute to the pandemic influenza public health response. *Australian Journal of Advanced Nursing (Online)*, 28(3), 47.
- Ibrahim, M. B., & Abdelreheem, M. H. (2015). Prevalence of anxiety and depression among medical and pharmaceutical students in Alexandria University. *Alexandria Journal of Medicine*, 51(2), 167–173. <https://doi.org/10.1016/j.ajme.2014.06.002>
- Jenkins, P. E., Ducker, I., Gooding, R., James, M., & Rutter-Eley, E. (2021). Anxiety and depression in a sample of UK college students: A study of prevalence, comorbidity, and quality of life. *Journal of American College Health*, 69(8), 813–819. <https://doi.org/10.1080/07448481.2019.1709474>
- Kuru Alici, N., & Ozturk Copur, E. (2022). Anxiety and fear of COVID-19 among nursing students during the COVID-19 pandemic: A descriptive correlation study. *Perspectives in Psychiatric Care*, 58(1), 141–148.
- Lee, J., Jeong, H. J., & Kim, S. (2021). Stress, anxiety, and depression among undergraduate students during the COVID-19 pandemic and their use of mental health services. *Innovative Higher Education*, 46(5), 519–538. <https://doi.org/10.1007/s10755-021-09552-y>
- Ma, Z., Zhao, J., Li, Y., Chen, D., Wang, T., Zhang, Z., Chen, Z., Yu, Q., Jiang, J., Fan, F., & Liu, X. (2020). Mental health problems and correlates among 746 217 college students during the coronavirus disease 2019 outbreak in China. *Epidemiology and Psychiatric Sciences*, 29, e181. <https://doi.org/10.1017/S2045796020000931>
- Marroquín, B., Vine, V., & Morgan, R. (2020). Mental health during the COVID-19 pandemic: Effects of stay-at-home policies, social distancing behavior, and social resources. *Psychiatry Research*, 293, 113419. <https://doi.org/10.1016/j.psychres.2020.113419>
- McDonald, C. (2020). Reopening schools in the time of pandemic: Look to the school nurses. *The Journal of School Nursing*, 36(4), 239–240. <https://doi.org/10.1177/1059840520937853>
- Mendez-Pinto, I., Antuña-Casal, M., & Mosteiro-Diaz, M. P. (2023). Psychological disorders among Spanish nursing students three months after COVID-19 lockdown: A cross-sectional study.

- International Journal of Mental Health Nursing*, 32(2), 479–489. <https://doi.org/10.1111/inm.13086>
- Moreira de Sousa, J., Moreira, C. A., & Telles-Correia, D. (2018). Anxiety, depression and academic performance: A study amongst Portuguese medical students versus non-medical students. *Acta Medica Portuguesa*, 31(9), 454–462. <https://doi.org/10.20344/amp.9996>
- Odrozola-González, P., Planchuelo-Gómez, Á., Irurtia, M. J., & de Luis-García, R. (2020). Psychological effects of the COVID-19 outbreak and lockdown among students and workers of a Spanish university. *Psychiatry Research*, 290, 113108. <https://doi.org/10.1016/j.psychres.2020.113108>
- Oteir, A. O., Nazzal, M. S., Jaber, A. F., Alwidyan, M. T., & Raffee, L. A. (2022). Depression, anxiety and insomnia among frontline health-care workers amid the coronavirus pandemic (COVID-19) in Jordan: A cross-sectional study. *BMJ Open*, 12(1), e050078. <https://doi.org/10.1136/bmjopen-2021-050078>
- Ozamiz-Etxebarria, N., Dosil-Santamaria, M., Picaza-Gorrochategui, M., & Idoiaga-Mondragon, N. (2020). Niveles de estrés, ansiedad y depresión en la primera fase del brote del COVID-19 en una muestra recogida en el norte de España. [Stress, anxiety, and depression levels in the initial stage of the COVID-19 outbreak in a population sample in the northern Spain]. *Cadernos de Saúde Pública*, 36(4). <https://doi.org/10.1590/0102-311x00054020>
- Patelrou, A., Mechili, E. A., Galanis, P., Zografakis-Sfakianakis, M., Konstantinidis, T., Salijs, A., Bucaj, J., Alushi, E., Carmona-Torres, J. M., Cobo-Cuenca, A. I., Laredo-Aguilera, J. A., & Patelrou, E. (2021). Nursing students, mental health status during COVID-19 quarantine: Evidence from three European countries. *Journal of Mental Health (Abingdon, England)*, 30(2), 164–169. <https://doi.org/10.1080/09638237.2021.1875420>
- Picaza Gorrochategui, M., Eiguren Munitis, A., Dosil Santamaria, M., & Ozamiz Etxebarria, N. (2020). Stress, anxiety, and depression in people aged over 60 in the COVID-19 outbreak in a sample collected in Northern Spain. *The American Journal of Geriatric Psychiatry*, 28(9), 993–998. <https://doi.org/10.1016/j.jagp.2020.05.022>
- R Core Team (2020). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. <https://www.R-project.org/>
- Rathnayake, S., & Ekanayaka, J. (2016). Depression, anxiety and stress among undergraduate nursing students in a public university in Sri Lanka. *International Journal of Caring Sciences*, 9(3), 1020–1032.
- Rehmani, N., Khan, Q. A., & Fatima, S. S. (2018). Stress, anxiety and depression in students of a private medical school in Karachi, Pakistan. *Pakistan Journal of Medical Sciences*, 34(3), 696–701. <https://doi.org/10.12669/pjms.343.14664>
- Roy, D., Tripathy, S., Kar, S. K., Sharma, N., Verma, S. K., & Kaushal, V. (2020). Study of knowledge, attitude, anxiety & perceived mental healthcare need in Indian population during COVID-19 pandemic. *Asian Journal of Psychiatry*, 51, 102083. <https://doi.org/10.1016/j.ajp.2020.102083>
- Saeed, H., Saleem, Z., Ashraf, M., Razzaq, N., Akhtar, K., Maryam, A., Abbas, N., Akhtar, A., Fatima, N., Khan, K., & Rasool, F. (2018). Determinants of anxiety and depression among university students of Lahore. *International Journal of Mental Health and Addiction*, 16(5), 1283–1298. <https://doi.org/10.1007/s11469-017-9859-3>
- Sakai, M., Nakanishi, M., Yu, Z., Takagi, G., Toshi, K., Wakashima, K., & Yoshii, H. (2022). Depression and anxiety among nursing students during the COVID-19 pandemic in Tohoku region, Japan: A cross-sectional survey. *Japan Journal of Nursing Science*, 19(3), e12483. <https://doi.org/10.1111/jjns.12483>
- Savitsky, B., Findling, Y., Erel, A., & Hendel, T. (2020). Anxiety and coping strategies among nursing students during the covid-19 pandemic. *Nurse Education in Practice*, 46, 102809. <https://doi.org/10.1016/j.nepr.2020.102809>
- Seale, H., Leask, J., Po, K., & MacIntyre, C. R. (2009). “Will they just pack up and leave?” – Attitudes and intended behaviour of hospital health care workers during an influenza pandemic. *BMC Health Services Research*, 9, 30. <https://doi.org/10.1186/1472-6963-9-30>
- Silverberg, J. I., Gelfand, J. M., Margolis, D. J., Boguniewicz, M., Fonacier, L., Grayson, M. H., Ong, P. Y., Chiesa Fuxench, Z. C., & Simpson, E. L. (2019). Symptoms and diagnosis of anxiety and depression in atopic dermatitis in U.S. adults. *British Journal of Dermatology*, 181(3), 554–565. <https://doi.org/10.1111/bjd.17683>
- Song, Z., Xu, Y., Bao, L., Zhang, L., Yu, P., Qu, Y., Zhu, H., Zhao, W., Han, Y., & Qin, C. (2019). From SARS to MERS, thrusting coronaviruses into the spotlight. *Viruses*, 11(1), 59. <https://doi.org/10.3390/v11010059>
- Spanish Government. (2018). Ley Orgánica 3/2018, de 5 de diciembre, de Protección de Datos Personales y garantía de los derechos digitales. [Organic Law 3/2018, of December 5, on the protection of personal data and guarantee of the digital rights]. *Boletín Oficial Del Estado*, 119788–119857. <https://www.boe.es/eli/es/lo/2018/12/05/3>
- Spanish Government. (2020). *Real Decreto 463/2020, de 14 de marzo, por el que se declara el estado de alarma para la gestión de la situación de crisis sanitaria ocasionada por el COVID-19*. [Royal Decree 463/2020, of March 14, declaring the state of alarm for the management of the health crisis situation caused by the COVID-19]. <https://boe.es/boe/dias/2020/03/11/pdfs/BOE-A-2020-3434.pdf#BOE>
- Suarez-Garcia, J., Maestro-Gonzalez, A., Zuazua-Rico, D., Sánchez-Zaballos, M., & Mosteiro-Diaz, M. (2018). Stressors for Spanish nursing students in clinical practice. *Nursing Education Today*, 64, 16–20. <https://doi.org/10.1016/j.nedt.2018.02.001>
- Terol, M. C., López-Roig, S., Rodríguez-Marín, J., Martín-Aragón, M., Pastor, M. A., & Reig, M. (2007). Propiedades psicométricas de la Escala Hospitalaria de Ansiedad y Estrés (HAD) en población española [Hospital Anxiety and Depression Scale (HAD): Psychometric properties in Spanish population]. *Ansiedad y Estrés*, 13, 163–176.
- Terol-Cantero, M., Cabrera-Perona, V., & Martín-Aragón, M. (2015). Revisión de estudios de la Escala de Ansiedad y Depresión Hospitalaria (HAD) en muestras españolas. [Hospital Anxiety and Depression Scale (HADS) review in Spanish Samples]. *Anales de Psicología*, 31(2), 494–503. <https://doi.org/10.6018/analesps.31.2.172701>
- UNESCO. (2020). *COVID-19 Educational disruption and response*. <https://en.unesco.org/covid19/educationresponse>
- Vahedian-Azimi, A., Moayed, M. S., Rahimibashar, F., Shojaei, S., Ashtari, S., & Pourhoseingholi, M. A. (2020). Comparison of the severity of psychological distress among four groups of an Iranian population regarding COVID-19 pandemic. *BMC Psychiatry*, 20(1), 402. <https://doi.org/10.1186/s12888-020-02804-9>
- Wallace, S., Schuler, M. S., Kaulback, M., Hunt, K., & Baker, M. (2021). Nursing student experiences of remote learning during the COVID-19 pandemic. *Nursing Forum*, 56(3), 612–618. <https://doi.org/10.1111/nuf.12568>
- Wang, C., & Zhao, H. (2020). The impact of COVID-19 on anxiety in Chinese university students. *Frontiers in Psychology*, 11, 1168. <https://doi.org/10.3389/fpsyg.2020.01168>
- Wathelet, M., Duhem, S., Vaiva, G., Baubet, T., Habran, E., Veerapa, E., Debien, C., Molenda, S., Horn, M., Grandgenèvre, P., & D'Hondt, F. (2020). Factors associated with mental health disorders among university students in France confined during the COVID-19 pandemic. *JAMA Network Open*, 3(10), e2025591. <https://doi.org/10.1001/jamanetworkopen.2020.25591>
- Weber, S., Puta, C., Lesinski, M., Gabriel, B., Steidten, T., Bär, K. J., Herbsleb, M., Granacher, U., & Gabriel, H. H. W. (2018). Symptoms of anxiety and depression in young athletes using the hospital anxiety and depression scale. *Frontiers in Physiology*, 9, 182. <https://doi.org/10.3389/fphys.2018.00182>
- Woodgate, R. L., Taylor, K., Tennent, P., Wener, P., & Altman, G. (2020). The experience of the self in Canadian youth living with anxiety: A qualitative study. *PLoS One*, 15(1), e0228193. <https://doi.org/10.1371/journal.pone.0228193>

- World Health Organization. (2020a). WHO coronavirus disease (COVID-19) dashboard. <https://covid19.who.int/region/euro/country/es>
- World Health Organization. (2020b). WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020. <https://www.who.int/es/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>
- Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica*, 67(6), 361–370. <https://doi.org/10.1111/j.1600-0447.1983.tb09716.x>

## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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