









Mental health challenges and academic strain among nursing students in Spain during the COVID-19 health emergency

A cross-sectional study

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Abstract

The COVID-19 pandemic, declared a global emergency by the World Health Organization, significantly impacted Spain, straining its National Health System and disrupting daily life, including education. Undergraduate nursing students faced particular challenges due to the shift to online learning and the demands of clinical placements. This study aimed to assess the academic engagement and the presence of anxiety and fear of COVID-19 in undergraduate Nursing students in Spain. The study employed an observational, cross-sectional design using an online questionnaire disseminated between October 2021 and May 2022. A non-probabilistic snowball sampling technique was used to recruit 1197 students from across Spain. The questionnaire included socio-demographic variables, personal COVID-19 experiences, the anxiety and fear of COVID-19 scale to measure anxiety and fear, and the Utrecht Work Engagement Scale (student version) to assess academic engagement. This study found significant levels of anxiety and fear among the students. Females reported higher scores on the anxiety and fear of COVID-19 scale compared to males. Higher levels of anxiety and fear were also observed in students who considered themselves part of a risk group and those who perceived a lack of sufficient self-protection measures during clinical placements. Interestingly, students who had received multiple doses of the COVID-19 vaccine also reported higher levels of anxiety and fear. Students in the final stages of their studies showed reduced academic engagement. The study highlights the need for universities to implement mental health support strategies for nursing students. It also emphasizes the importance of improved public policies to ensure the availability of personal protective equipment and adequate training in infection control for students during clinical placements. Addressing the emotional well-being of future healthcare professionals is crucial.

Abbreviations: AMICO = anxiety and fear of COVID-19 scale (Ansiedad y Miedo al COVID-19), COVID-19 = coronavirus disease 2019, PPE = personal protective equipment, SPSS = Statistical Package for the Social Sciences, UK = United Kingdom, UWES = Utrecht Work Engagement Scale, UWES-S = Utrecht Work Engagement Scale – student version.

Keywords: academic engagement, anxiety, COVID-19 pandemic, emotional well-being, fear, nursing students, Spain

1. Introduction

The impact of the 2019 coronavirus disease (COVID-19), declared by the World Health Organization a Public Health Emergency of International Concern on January 30, 2020,^[1] and subsequently a pandemic on March 11, 2020, imposed a

need for effective global adaptation to the new situation and to the population's needs.

Although all countries were affected, in Europe, Italy, the United Kingdom, and Spain were among the first to report confirmed cases of COVID-19 as of January 31, 2020.^[2,3] In Spain, the rapid spread of the virus necessitated the implementation of

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drastic containment measures, including social isolation, quarantine, and lockdown, the latter extended until June 21, 2020.^[4] These measures profoundly altered daily life and impacted all sectors of society. The mortality rate in Spain between February and the end of May 2020 was 38%, the highest figure among 21 industrialized countries worldwide,^[5] with people over 80 years old having the highest prevalence of hospitalization and death.^[6]

The rapid onset of the disease revealed some important deficiencies in the National Health System. These shortcomings were evidenced by stock shortages of personal protective equipment (PPE), the lack of early warning systems, and delays in the diagnosis and treatment of other diseases, such as oncological ones. As a result, healthcare services became primarily focused on COVID-19 patients, leading to a reduction in scheduled consultations and planned treatment procedures.^[7,8]

Students were among the population groups most affected by the consequences of the COVID-19 lockdown. The declaration of the State of Alarm led to a series of severe measures for social isolation and thorough control of the spread of the disease that caused a drastic change in the daily life habits of students, as well as in their educational activities in classrooms and academic environments.^[9] Universities made adjustments to their teaching methodology in order to ensure that students were able to continue their education under the new conditions forced by the pandemic. At first, classes were paralyzed and, subsequently, the use of online teaching was implemented.^[10] The transition to online education was hampered by connectivity problems, difficulty in concentration due to increased digital stimuli, decreased learning achievement, and increased mental health effects related to changes in lifestyle, anxiety disorders, fear, and sleeping problems.^[11-14]

This new academic context particularly affected students enrolled in degree programs with a strong practical component, such as nursing. Despite the widespread use of virtual teaching, certain university programs – such as the nursing degree – incorporate clinical placements and simulation-based learning as integral components of the curriculum to acquire essential technical skills. These were significantly disrupted due to the imposed lockdown. Previous studies have highlighted the impact of the COVID-19 pandemic on the mental health of university students, with nursing students emerging as a particularly vulnerable group. Brett et al^[15] interviewed 216 student nurses in the UK and found clear evidence of the insecurity they experienced during their initial clinical placements amid the pandemic. This insecurity stemmed primarily from 2 sources: first, the physical distancing from patients, which impeded the acquisition of technical competencies essential to providing care; and second, a pervasive fear of infection.

Simultaneously, the COVID-19 pandemic triggered widespread emotional and psychological disruptions among Nursing students worldwide, with symptoms such as anxiety, fear, sleep disturbances, and depression being among the most commonly reported.^[16-22] This new reality prompted the development of valid and reliable instruments to measure the emotional impact of the pandemic across different populations. Among them, the Fear of COVID-19 Scale developed by Ahorsu et al,^[23] the coronavirus anxiety scale by Lee,^[24] and the COVID-19 phobia scale^[25] have provided useful tools to measure specific aspects of psychological distress. The anxiety and fear of COVID-19 (Ansiedad y Miedo al COVID-19 [AMICO]) scale^[26] was later developed to assess both constructs together in the general population and has since been validated in subgroups such as pregnant women, older adults in Spain,^[27,28] and nurses in the United Kingdom.^[29]

Within the academic context, measuring academic engagement provides key insight into students' well-being and performance. The student version of the Utrecht Work Engagement Scale (UWES-S) has been widely used to assess this construct.^[30] Academic engagement reflects students' cognitive and emotional

connection to their learning, a factor that becomes especially important during periods of adversity. Prior research has demonstrated a significant relationship between high anxiety levels and decreased academic engagement and performance, which is particularly concerning in professions like nursing, where disengagement may compromise both learning and future patient care.^[31]

Understanding academic engagement in nursing students during the pandemic is therefore not only relevant for educational outcomes, but also for ensuring long-term professional readiness. It serves as a protective factor against academic burnout and psychological distress and provides an indicator of students' capacity to adapt and persist in adverse contexts.^[32] Factors such as social and family support and the relationship with teachers also enhance academic commitment and, consequently, psychological well-being and performance. The promotion of autonomy, emotional support interventions and active learning strategies can strengthen this commitment, thus promoting academic success.^[33] Therefore, promoting academic engagement is essential to prevent dropout, improve performance and protect the mental health of students at all educational levels.^[34,35]

Given the high global impact of the COVID-19 pandemic on mental health and the particular characteristics of undergraduate nursing students, it is critical to examine both their emotional distress and academic engagement. Therefore, the aim of the present study was to assess the levels of academic engagement, anxiety, and fear of COVID-19 among undergraduate nursing students in Spain and to explore the relationships between these constructs.

2. Material and methods

2.1. Design

This study was designed following an observational methodology and implemented in a cross-sectional way by means of an online questionnaire. The questionnaire was disseminated between October 28, 2021 and May 31, 2022, due to the nature of the study, which included the national scope. For its elaboration and design, the strengthening the reporting of observational studies in epidemiology (checklist for reporting observational studies) checklist^[36] and the classification made by Herzog et al^[37] were followed.

2.2. Population and sample

A snowball non-probabilistic sampling technique was used.^[38] The sample was accessed through official and authorized channels, namely the Spanish Association of Nursing Degree Students and the National Council of Nursing Students, and via the different Deans of the Spanish Universities. The inclusion criterion was to be a student of the Bachelor's Degree in Nursing in Spain during the pandemic period. All subjects were provided with the pertinent information on the purpose of the questionnaire, as well as on the voluntary nature of their participation. Anonymity and confidentiality of the responses were also ensured, guaranteeing these conditions to all subjects. The exact response rate could not be calculated due to the nature of the sampling used.

Data collection was done through an online questionnaire designed using the GoogleForms© application which included information about the study and the items related to the study variables. Questionnaires that were not fully completed were excluded from the final sample.

The Qualtrics® tool was used to calculate the sample size, based on the equation "Sample size (n) = (Z²) × Standard deviation × (1-Standard deviation)/(Margin of error),^[21] with a confidence level for "Z" of 95%, a standard deviation of 0.5, and a margin of error of ± 5%.

Based on the number of students enrolled in a Bachelor's Degree in Nursing in Spain in the academic year 2021 to 2022 as published by the Spanish Ministry of Universities,^[39] the total population was 50,688 and a required sample of at least 382 subjects was estimated, with an expected proportion of losses of 25%. The final total sample was 1197 students, after excluding those incomplete questionnaires. The students came from all the autonomous regions and virtually all the provinces of Spain, with 47 of the 52 provinces represented.

2.3. Variables and instruments

The questionnaire consisted of 4 sections. The first included socio-demographic variables such as sex, age, province of residence, province where the degree was being studied, year of study, whether it was a public, private, or affiliated center, number of cohabitants in the household, and assessment of general health status with a score from 1 to 10.

The second section included personal questions on COVID-19 regarding diagnosis of the disease in their own person and/or close environment, having suffered isolation due to the infection, considering themselves as part of a risk group, the presence of sufficient information on the disease during the pandemic, the most consulted sources of information, whether they worked while studying, whether their working conditions and clinical placements had been affected by the pandemic, whether self-protection measures were sufficiently provided, whether they had received sufficient training in COVID-19, how they rated the information received, whether they felt protected and safe during their clinical placements, and whether they had been vaccinated against the infection.

The third section was dedicated to the AMICO scale to measure anxiety and fear of COVID-19.^[40]

The fourth and last part included the Utrecht Work Engagement Scale (UWES),^[41] in its version adapted for students (UWES-S),^[30] for the assessment of the "academic engagement" variable. Academic commitment was considered a relevant variable due to its relationship with mental health.

A questionnaire containing all these items was developed for the assessment of the variables. Socio-demographic data and reports on the information received and prevention measures adopted during the COVID-19 pandemic were obtained from questions previously validated by the research team in a previous study.^[26,40] Additionally, the AMICO scale was included to assess the level of anxiety and fear of the disease and the UWES-S scale was used to measure academic engagement. The adequacy of the entire questionnaire was assessed by a panel of experts in various disciplines (Public Health, Medicine, Nursing, Social Work, and Psychology), using the Delphi technique.

The AMICO scale has proven to be a valid and reliable tool for screening for the presence of anxiety and fear of the disease in nursing students.^[40] The AMICO scale consists of 16 items distributed according to 2 factors, namely anxiety and fear. Responses range from 1 to 10, with 1 being the lowest self-reported level and 10 being the highest. The reliability study of the scale showed high internal consistency and a Cronbach's α value of 0.92.

Similarly, the 17-item UWES-S^[30] is a self-administered questionnaire with values measured on a 7-point Likert scale with response options ranging from 0 (never) to 6 (every day). The scale has a Cronbach's α of 0.93.

2.4. Procedure and ethical approval

The approval and conformity of the Deans of all the schools of Nursing in Spain and the Research Ethics Committee of the Regional Research Community of the Regional Government of Andalusia (with code PI 036/20) were obtained prior to the

recruitment of the sample and the dissemination of the instrument. For this study, the Declaration of Helsinki on Ethical Principles for Research Involving Human Subjects was taken as a reference.^[42] Additionally, the confidentiality and secrecy of personal information was respected in accordance with Organic Law 3/2018, of December 5, on the protection of personal data and the guarantee of digital rights.

Subjects were asked to indicate their agreement to participate in the study, ensuring voluntariness, anonymity, and confidentiality of all responses. They were also informed that participation or nonparticipation would have no positive or negative implications and that they could drop out of the study at any time. Since the instrument was applied through a digital questionnaire, measures were implemented to avoid risks such as duplicate responses or the inclusion of ineligible participants. After reading this information, participants had to select the option of being 18 years of age or older and indicate "YES, I GIVE IT" on the written informed consent form. The consent form could be accessed through the link to the questionnaire.

2.5. Data analysis

The statistical analysis was carried out using SPSS Statistics© v26 software (IBM, Armonk).^[43] First, a univariate descriptive analysis was performed, in which frequencies, means, and standard deviations were calculated according to the type of variable. To assess the normality of the data, the Kolmogorov-Smirnov test was applied, obtaining a value of $P < .005$, which indicated non-normal distribution of the data. Consequently, nonparametric tests were used in the subsequent analyses.

As for the bivariate analysis, contrast tests, specifically the Mann-Whitney U test and the Kruskal-Wallis test, were used to identify statistically significant differences across the study variables. In addition, the correlation between quantitative variables was examined using Kendall's Tau- b test.

Additionally, a binary logistic regression analysis was carried out to develop a predictive model of the presence of anxiety and fear in relation to other variables. For the construction of the model, only those significant variables identified through the Wald method were included, seeking to maintain a solid and robust model. The adequacy of the model was assessed using various goodness-of-fit metrics, such as the Hosmer-Lemeshow test, the percentage of correctly classified values, and measures of sensitivity and specificity. Finally, the selection of variables was based on statistical significance tests, estimating odds ratios together with their respective confidence intervals to interpret the association between the variables.

3. Results

3.1. Descriptive analysis

The total sample consisted of 1197 undergraduate Nursing students residing in Spain. Table 1 shows that, of the total sample, 85% were female and 14.6% male. Additionally, 0.1% considered themselves nonbinary and the rest preferred not to respond to this item. The age of the sample ranged from 17 to 57 years, with a mean of 22.35 years ($SD = 5.783$).

Table 2 shows data relating to the place of residence. Most of the participants were from the province of Seville (15.7%), with Guadalajara and Avila being the least represented provinces (0.1%). As shown in Table 1, 28.2% of the sample was in their second year of the Bachelor's Degree in Nursing. The mean score for the number of cohabitants in the same household was 3.48 ($SD = 0.984$).

With regard to how well informed they felt during the pandemic, a mean score of 7.33 ($SD = 1.654$) was obtained for this variable. Likewise, participants rated their general health

Table 1
Description of the sample profile according to the study variables.

Quantitative variables	Value	Result
Age	Mean	22.35
	Standard deviation	5.783
	Range	Max = 57; Min = 17
Information during the pandemic	Mean	7.33
	Standard deviation	1.654
	Range	Max = 10; Min = 1
Number of cohabitants	Mean	3.48
	Standard deviation	0.984
	Range	Max = 6; Min = 1
General health	Mean	7.86
	Standard deviation	1.271
	Range	Max = 10; Min = 1
Total UWES	Mean	3.787
	Standard deviation	1.26
	Range	Max = 6; Min = 0.18
Total AMICO	Mean	4.06
	Standard deviation	1.546
	Range	Max = 9.56; Min = 1
Qualitative variables	Value	Result N = 1197
Sex	Male	n = 175 (14.6%)
	Female	n = 1017 (85%)
	Nonbinary	n = 1 (0.1%)
	Rather not say	n = 4 (0.3%)
Academic year	First of nursing	n = 304 (25.4%)
	Second of nursing	n = 338 (28.2%)
	Third of nursing	n = 290 (24.2%)
	Fourth of nursing	n = 265 (22.1%)
Diagnosis of COVID-19	No	n = 640 (53.5%)
	Yes	n = 557 (46.5%)
Isolation	No	n = 313 (26.1%)
	Yes	n = 884 (73.9%)
Risk group	No	n = 867 (72.4%)
	Yes	n = 330 (27.6%)
Self-protection measures	No	n = 487 (40.7%)
	Yes	n = 669 (55.9%)
	Other	n = 41 (3.4%)
Perceived protection during clinical placements	Somewhat protected	n = 361 (30.2%)
	Fairly protected	n = 565 (49.7%)
	Very protected	n = 56 (4.7%)
	No, not at all protected	n = 22 (1.8%)
COVID-19 vaccination	Yes, totally protected	n = 163 (13.6%)
	I do not wish to be vaccinated	n = 7 (0.6%)
	Yes, 1 dose only	n = 42 (3.5%)
	Yes, 2 doses	n = 368 (30.7%)
	Yes, all 3 doses	n = 778 (65%)
	Not yet	n = 2 (0.2%)

AMICO = anxiety and fear of COVID-19 scale, COVID-19 = coronavirus disease 2019, UWES = Utrecht Work Engagement Scale.

with a mean score of 7.86 (SD = 1.271), despite the fact that 73.9% had to be isolated at some point due to close contact or illness, and of these, 46.5% stated that they had been diagnosed with COVID-19 at some point. Moreover, the vast majority of the sample (72.4%) said they were not part of the risk groups.

About 55.9% of the students stated that their academic contacts provided them with the necessary self-protection measures to avoid contagion and 65.2% had received some form of specific training to avoid contagion (Table 3). Accordingly, only 6.5% reported feeling very unsafe or not safe at all during their clinical placements. Also noteworthy is that only 0.2% had not been vaccinated with any dose against COVID-19, while the majority had already been vaccinated with the corresponding 3 doses (65%). For the UWES scale, which measures academic

engagement, a total score of 3.79 (SD = 1.26) was obtained, with a maximum score of 6.

The total score of the AMICO scale obtained a mean value of 4.06 (SD = 1.546), with a range of scores between 1 and 9.56. When applying the Kolmogorov–Smirnov test, with a significance of $P < .001$, it was found that the distribution of the AMICO scale scores did not follow a normal distribution, so nonparametric tests were performed.

The bivariate analysis for the total AMICO variable (Table 4) revealed statistically significant differences between the mean scale score and sex, place of residence, number of cohabitants, general health, diagnosis of COVID-19, considered part of a risk group, perceived protection during clinical placements, COVID-19 vaccination, and the total UWES-S scale score. Females showed the highest levels of anxiety and fear on the AMICO scale, with a score of 4.15, compared to males, who scored 3.54. Regarding the place of residence, students from Cuenca scored the highest on the AMICO scale, with a mean score of 5.03 (Table 5), as did those cohabiting with others. In this last case, there was an upward trend in the mean AMICO_TOTAL score as the number of cohabitants increased, from 3.52 when there were no other people living in the house, to 4.10 when there were 3 cohabitants and 5.69 when there were >6 cohabitants.

Anxiety and fear levels were also higher in those students who had never been diagnosed with COVID-19, with a score of 4.16, as well as in those who considered themselves part of a risk group, with a score of 4.37, and those who did not consider they had received sufficient self-protection measures during their clinical placements, with a score of 4.12. Those who had already been vaccinated against COVID-19 on several occasions also scored high on the AMICO scale, with a score of 4.13 points.

3.2. Regression analysis

The regression analysis was first conducted based on the mean total score of the AMICO questionnaire as the dependent variable, and then on the other variables (Table 6), showing that only sex, belonging to a risk group, perceived protection during clinical placements, and the number of cohabitants in the household were significant variables.

4. Discussion

The aim of the present study was to assess academic engagement and the presence of anxiety and fear of COVID-19 in undergraduate nursing students in Spain. This study provides a comprehensive insight into the influence of factors relating to health and the pandemic on the emotional well-being and academic engagement of students.

The results obtained using the AMICO scale were significant in terms of anxiety and fear, particularly among females, suggesting the need to further explore the differential impact of the pandemic by sex ($P < .001$). Notably, the marked imbalance in the sample, with only 14% of participants being male, may have influenced the results. While this difference could be considered a limitation in terms of generalisability, it also represents a methodological strength as it accurately reflects the composition of the student population in this field. This particular distribution by sex among students in this field has also been reported in the literature.^[18,44–48] However, further research should seek to more closely explore whether sex acts as a confounding or interacting factor in the relationship between the pandemic and students' emotional well-being, considering other variables such as socio-economic background, academic burden, or access to support networks.

These results are also consistent with previous studies such as the one by Bacigalupe et al,^[49] which showed a clear relationship

Table 2
Sample size by place of residence.

Province	Frequency	Percentage	Cumulative %	Province	Frequency	Percentage	Cumulative %
Alava	3	0.3	0.3	Albacete	10	0.8	1.1
Alicante	18	1.5	2.6	Almeria	28	2.3	4.9
Asturias	45	3.8	8.7	Avila	1	0.1	8.8
Badajoz	6	0.5	9.3	Baleares	9	0.8	10.0
Barcelona	15	1.3	11.3	Burgos	5	0.4	11.7
Caceres	8	0.7	12.4	Cadiz	113	9.4	21.8
Cantabria	23	1.9	23.7	Castellon	10	0.8	24.6
Ceuta	28	2.3	26.9	Ciudad Real	9	0.8	27.7
Community of Ma-drid	46	3.8	31.5	Cordoba	52	4.3	35.8
Cuenca	2	0.2	36.0	Granada	30	2.5	38.5
Guadalajara	1	0.1	38.6	Guipuzcoa	7	0.6	39.2
Huelva	122	10.2	49.4	Huesca	2	0.2	49.5
Jaen	25	2.1	51.6	La Coruña	36	3.0	54.6
La Rioja	3	0.3	54.9	Las Palmas	2	0.2	55.1
Leon	14	1.2	56.2	Lugo	15	1.3	57.5
Malaga	85	7.1	64.6	Melilla	2	0.2	64.7
Navarra	18	1.5	66.2	Orense	24	2.0	68.3
Palencia	5	0.4	68.7	Pontevedra	18	1.5	70.2
Region of Murcia	32	2.7	72.8	Salamanca	12	1.0	73.9
Sta. Cruz Tenerife	12	1.0	74.9	Segovia	2	0.2	75.0
Sevilla	188	15.7	90.7	Tarragona	2	0.2	90.9
Toledo	22	1.8	92.7	Valencia	52	4.3	97.1
Valladolid	9	0.8	97.8	Vizcaya	7	0.6	98.4
Zaragoza	19	1.6	100.0				

Table 3
Specific training in COVID-19.

	Frequency	Percentage
No	409	34.2
Other	8	0.7
Yes	780	65.2
Total	1197	100.0

COVID-19 = coronavirus disease 2019.

between sex and mental health, as well as the existing disparity in the diagnosis of mental pathologies across both sexes, with a visibly higher proportion of females suffering from alterations in emotional well-being and pathologies with treatment prescribed by a physician. Other studies are consistent in terms of the relationship between the female sex and a higher prevalence of disorders such as depression, anxiety, and stress, not finding evidence of a direct relationship between the healthcare profession and the increase in mental health pathologies as compared to the general population.^[50] Likewise, no significant relationship has been found between male sex and COVID-19 mortality. However, an association has been identified between mortality and other risk factors, such as older age and specific comorbidities.^[51]

In this way, the AMICO scale revealed high levels of anxiety and fear of COVID-19 in those students who considered themselves to be part of risk groups ($P < .001$) due to the presence of diseases such as obesity, chronic obstructive pulmonary disease, other respiratory pathologies, diabetes, oncological processes and immunosuppression, as well as in pregnant women. These students are identified as in an unfavorable position compared to those who do not present with these risk factors, being more vulnerable to both COVID-19 infection and to a worse outcome in case of infection.

Another group that exhibited high levels of anxiety and fear of COVID-19 was the group of students who had received all 3 doses of the vaccine against the disease. It might be expected that this group would show a lower prevalence of these disturbances given that vaccination could act as a relieving factor for

the fears and worries associated with the disease. However, the data obtained indicate an inverse relationship. This finding may be explained by the fact that students with the greatest fear of COVID-19 were in fact those who had opted for completing the vaccination schedule, thus reflecting a greater perception of risk. This is likely to be related to factors such as cohabitation with others or the absence of previous COVID-19 infection, which may be associated with these individuals seeking greater protection against the disease, in contrast to those who did not prioritize vaccination.^[52] Given the possible interaction with uncontrolled variables such as those mentioned above, caution is recommended in their interpretation and consider it as a way to be explored in future research.

The AMICO scale revealed a high prevalence of anxiety and fear of COVID-19 among nursing students who reported not having received sufficient self-protection measures against the disease during their clinical placements ($P < .001$). The COVID-19 pandemic highlighted, among other aspects, the gaps in the resources available to deal with a pandemic. The article by Raurell-Torredà et al^[53] showed that the needs expressed by the population were advancing faster than the public administration could respond to them. It quickly became apparent that there was a lack of PPE to cope with the number of patients coming to the health centers, as well as a lack of health professionals to attend to the health needs of the population. Healthcare professionals were becoming increasingly scarce as infection spread at a rapid pace and as the material resources to protect themselves were in short supply.^[53]

The UWES-S scale was used to assess the degree of academic engagement of undergraduate Nursing students in Spain. The data obtained indicate that those students who were in the final stages of their studies, coinciding with the highest load of compulsory clinical placements within the academic curriculum, were the most vulnerable to reduced academic engagement. This reduced engagement could be influenced by a number of factors, including the extreme situation experienced during the pandemic, which highlighted the lack of human and material resources to cope with the demands of the health sector. Additionally, the high psycho-emotional demands of dealing with the various clinical situations may also reflect on both the students and the professionals involved in their training.^[54]

Table 4**Bivariate analysis based on the AMICO score and the study variables.**

Variable	Sample and percentage	Mean AMICO score	Contrast hypothesis
Sex			
Male	n = 175 (14.6%)	3.54	
Female	n = 1017 (85%)	4.15	$P = .000^*$
Nonbinary	n = 1 (0.1%)	3.25	
Rather not say	n = 4 (0.3%)	4.58	
Diagnosis of COVID-19			
No	n = 640 (53.5%)	4.16	$P = .028^*$
Yes	n = 557 (46.5%)	3.95	
Considered part of a risk group			$P = .000^*$
No	n = 867 (72.4%)	3.94	
Yes	n = 330 (27.6%)	4.37	
Perceived protection during clinical placements			
No	n = 487 (40.7%)	4.12	
Yes	n = 669 (55.9%)	4.04	$P = .00^*$
Other	n = 41 (3.4%)	3.74	
COVID-19 vaccination			
I do not wish to be vaccinated	n = 7 (0.6%)	2.33	
Yes, 1 dose only	n = 42 (3.5%)	3.76	$P = .013^{\ddagger}$
Yes, 2 doses	n = 368 (30.7%)	3.99	
Yes, all 3 doses	n = 778 (65%)	4.13	
Not yet	n = 2 (0.2%)	2.88	

Variable	Mean (SD)	Contrast hypothesis
Number of cohabitants	7.33 (1.654)	Tau b = .007 [†]
General health	7.86 (1.271)	Tau b = .007 [†]
UWES scale	3.7872 (1.260)	Tau b = .008 [†]

AMICO = anxiety and fear of COVID-19 scale, COVID-19 = coronavirus disease 2019, UWES = Utrecht Work Engagement Scale.

*Mann-Whitney *U*.†Kendall's *b* tau.

‡Analysis of variance (ANOVA).

Table 5**Mean AMICO score by place of residence.**

	AMICO_TOTAL (mean)		
Alava	2.35	Jaen	3.85
Albacete	3.73	La Coruña	3.44
Alicante	3.61	La Rioja	2.08
Almeria	4.26	Las Palmas	3.81
Asturias	3.67	Leon	4.47
Avila	4.50	Lugo	3.53
Badajoz	4.79	Malaga	4.05
Baleares	4.90	Melilla	3.81
Barcelona	4.61	Navarra	3.73
Burgos	2.85	Orense	3.26
Caceres	3.83	Palencia	3.44
Cadiz	3.99	Pontevedra	3.44
Cantabria	3.78	Region of Murcia	4.17
Castellon	4.10	Salamanca	4.16
Ceuta	3.41	Santa Cruz de Tenerife	4.12
Ciudad Real	3.63	Segovia	2.88
Community of Madrid	4.40	Sevilla	4.36
Cordoba	4.21	Tarragona	3.88
Cuenca	5.03	Toledo	4.02
Granada	4.46	Valencia	4.46
Guadalajara	4.25	Valladolid	4.02
Guipuzcoa	4.23	Vizcaya	3.96
Huelva	4.22	Zaragoza	3.80
Huesca	2.59		

AMICO = anxiety and fear of COVID-19 scale.

4.1. Limitations

The limitations of this study are mainly related to the methodology applied, with the use of non-probabilistic snowball sampling being, on the one hand, a limiting factor in terms of

generalisability of the results to a wider population of nursing students,^[55] and on the other hand due to the inability to calculate the exact response rate.

On the other hand, the data collection period (October 2021–May 2022) was considered optimal to achieve a considerable sample, given the national involvement of the study, although it is recognized that the evolution of the pandemic may have influenced the perceptions of students throughout that period, so it is considered a limitation of this study.

Besides, data collection was conducted in a cross-sectional manner, which is useful for capturing the reality at the time but does not allow assessing the evolution of the experiences analyzed throughout the fluctuations of the COVID-19 pandemic and, therefore, it is not possible to provide more comprehensive information related to the whole context.^[37] Another limitation is determined by sex, with a higher prevalence of mental health disorders found in females^[49] and a greater representation of this sex in the Nursing student population, which may constitute a risk of bias.^[56] There were also differences between students with no previous health-care experience and those with experience, as the latter had to deal with the pandemic from both their role as students and their experience in the healthcare field. This aspect could introduce a bias, as an attempt has been made to generalize the opinions of all students without differentiating between these 2 groups.

4.2. Future lines of research

Future research is suggested using a longitudinal data collection methodology, with the aim of providing meaningful information on the emotional well-being of undergraduate Nursing students and how it fluctuated throughout the different stages of the COVID-19 pandemic.^[57]

Table 6
Model fit and significance of regression analysis.

Variables	Beta's coefficient	Degrees of freedom	Fisher's F	P-value
1. Sex	0.131	3	11.554	.000
2. Diagnosis of COVID-19	-0.034	2	1.026	.359
3. Risk group	0.073	2	3.732	.024
4. Perceived protection during clinical placements	-0.204	2	32.479	.000
5. COVID-19 vaccination	0.108	2	2.328	.098
6. Number of cohabitants	0.074	3	3.114	.025
7. General health	-0.032	2	0.304	.738
8. UWES_TOTAL	-0.066	2	2.041	.130

COVID-19 = coronavirus disease 2019, UWES = Utrecht Work Engagement Scale.

Equally relevant is the development of further studies to measure anxiety and fear of COVID-19 in other population groups of people with greater vulnerability, such as older adults, the chronically ill, oncology patients, and children. Conducting studies aimed at measuring these alterations in mental health in at-risk groups may provide a guide for the creation of future projects aimed at prevention and intervention in mental health problems at an early stage. Similarly, such studies could also be useful to be forewarned about the consequences of the pandemic affecting society as a whole and to know how to act in the event of a similar future situation.

On the other hand, the finding that indicates that nursing students with a greater risk perception also have greater adherence to vaccination could be influenced by uncontrolled variables, such as health status, fear of spreading the disease, previous experiences with COVID-19, or greater exposure in clinical environments. Therefore, this result is considered a possible line of future research. Moreover, the relationship between vaccination and anxiety remains underexplored. It is possible that individuals with higher anxiety or fear levels perceive a greater personal vulnerability to infection, which in turn may increase their motivation to seek protection through vaccination. Conversely, vaccination itself might not necessarily reduce anxiety, as persistent uncertainty about vaccine efficacy or new variants could sustain feelings of fear.^[58,59] Further studies adopting longitudinal or mixed-method designs are needed to clarify these psychological mechanisms and better understand how emotional factors shape health-related behaviors such as vaccination acceptance.

Finally, in terms of implications for practice, this study highlights the need to provide emotional and academic support to nursing students through qualified professionals, both from the universities themselves and from the actors involved in the training of students in health centers. Mental health care, from prevention to treatment when necessary, is essential to ensure the well-being of future health professionals, both in the current and future pandemics and in situations of restricted mobility, an aspect underlined by the results of this study. It is worth noting that students at a young age are influenced by a multitude of variables, such as biological, cultural, social, psychological and family variables, among others.^[60] Mental health is therefore an essential factor to be addressed by universities in order to prevent and assess possible changes that may affect academic performance, and to be able to deal with them at an early stage when they arise.

The experience of the COVID-19 pandemic in the hospital setting illustrates the need for improved public policies to protect students during clinical placements. The need for the administration to ensure the availability of PPE, including filtering face piece type 2 (types of high-efficiency respiratory masks) and filtering face piece type 3 (types of high-efficiency respiratory masks) masks, surgical masks, disposable gloves, waterproof gowns and goggles, as well as the necessary training in isolation procedures, handling suspected cases of infection and patients diagnosed with COVID-19 is highlighted.^[61]

Similarly, the pandemic has clearly evidenced the need to reduce the burden of care on students, with particular emphasis on physical distance. In this sense, in situations such as the COVID-19 pandemic, it is proposed to reduce face-to-face clinical placements exceptionally, prioritizing those that are essential and using clinical simulation resources wherever possible. The use of rotating shifts to avoid overcrowding and reduce the number of students attending health care facilities at the same time is also strongly recommended. During events of this type, it is recommended that regular COVID-19 diagnostic testing, daily symptom reporting, and temperature checks prior to entering the facility be implemented. In addition, it is suggested that health science students should be included in early vaccination protocols, as they are as much a risk group as healthcare professionals and their condition may contribute to an increased risk of infection.^[61]

5. Conclusions

This study assessed the emotional state and academic engagement of undergraduate nursing students in Spain during the COVID-19 pandemic, using 2 validated instruments: the AMICO scale for anxiety and fear of COVID-19, and the UWES-S scale for academic engagement. The findings were significant for both emotional variables, with higher levels of anxiety and fear observed among female students and those belonging to at-risk groups. The 2-factor structure of the AMICO scale was confirmed, supporting its validity and reliability in this academic context.

The results also revealed a direct relationship between the perceived risk of COVID-19 and vaccination adherence, with students experiencing higher anxiety being more likely to have completed the full vaccination regimen. In parallel, a negative association was observed between anxiety levels and academic engagement, underscoring the impact of emotional distress on students' ability to remain cognitively and emotionally connected to their studies.

These findings highlight the need to address both mental health and academic engagement in nursing education, particularly during times of crisis. Academic engagement is a key indicator of student well-being and performance, and its decline in the presence of anxiety reinforces the importance of providing targeted support.

From a public health and educational standpoint, the results emphasize the importance of institutional interventions that promote emotional well-being and academic resilience. Universities should implement comprehensive mental health support strategies – led by qualified professionals – focused on stress and anxiety management, as well as resilience training. These initiatives are essential to better prepare future healthcare professionals for both academic and clinical challenges. Furthermore, academic institutions are encouraged to integrate crisis-response protocols into nursing curricula to ensure preparedness for future public health emergencies while safeguarding students' emotional and academic stability.

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