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Research Article

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SARS-CoV2 Infection among Nursing Students Prospective Study

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Abstract

Aim: to analyse the incidence of COVID-19 among undergraduate and master's students at the nursing school during the 2020-2021 academic year, as well as to analyse the impact of the lock-down as a consequence of the infection on academic activity. **Method:** observational, descriptive and prospective study on the incidence of infections among students. **Results:** of the total number of students, 49 were infected [47/351 undergraduate students (13.4%) and 2/145 master's students (1.37%), p<0.001], 9.8% (49/496) on the total number of students. Out of these 49, 42 (85.7%) were women and 7 (14.2%) men with a mean age of 21.7±3.8 years. The mean cumulative incidence at 7 days was 240.7 weekly cases while in the general population it was 187.1 weekly cases per 100,000 population. The 87.8% of the students lived in the family nucleus at the time of infection. The main source of infection was the family nucleus in 32.6% of cases, followed by patients with 14.3%. Of the 49 students who became infected, 45 (91.8%) were enrolled in practical subjects and of these, in 27 (60%) the practice coincided with the moment of infection. The mean number of days of lock-down was 14.6 ± 5.2 days. **Conclusions:** the incidence of infections among nursing students was higher than that of the general population of the same age. Prospective monitoring has made it possible to take measures to cut the chain of infections between students and patients and thus guarantee the safety of the latter.

Keywords: Nursing students; Infection; COVID-19; Academic impact

Introduction

The COVID-19 pandemic, caused by the SARS-CoV2 virus, has infected more than 485 million people worldwide from December 2020 to March 2022 and caused nearly 6.31 million deaths [1].

SARS-CoV2 is transmitted via airborne droplets and aerosols released through coughing or sneezing [2,3]. The incubation period is usually 5 days, within a range from 2 to 14, and the most frequent early stages of the pandemic symptoms were fever, dry cough and shortness of breath, as well as loss of smell (anosmia) and taste (dysgeusia), among others [2,3]. This symptomatology, although it has remained as the most frequent among the different variants, has undergone some modifications in recent waves. Specifically, the omicron variant is much more contagious, but it presents with mild upper respiratory symptoms (e.g. rhinorrhoea, sneezing and nasal congestion) [4].

At high education level, the Nursing degree and Master lessons at the Hospital Santa Creu i Sant Pau (HSCSP) University School of Nursing (EUI-Sant Pau), affiliated to the Universitat Autònoma de Barcelona (UAB), and started in September 2020. The UAB instructed on delivering hybrid teaching5 (in-class/ face-to-face instruction and out-of-class/ online instruction), prioritizing face-to-face instruction in those educational activities that could not be carried out online (clinical placements, hands-on labs, training seminars and evaluation activities) [5].

The clinical practicum is a key component in the learning process of undergraduate and master's nursing students. It is understood as the specific training provided by the health institutions where the student is integrated into a multidisciplinary team that will allow him or her to consolidate the knowledge that has been acquired as well as values and attitudes [6-8].

In September 2020, heath centres required students to have a negative Polymerase Chain Reaction (PCR) before joining the clinical placement to guarantee the safety of patients and healthcare team [9]. During the 2021-2022 academic year, once the mass vaccination had begun, students were required to be fully vaccinated for COVID-19. The high contagiousness of the virus facilitated students' infection during placements, or during face-to-face teaching at nursing school..

The main objective of this study was to analyse the incidence of COVID-19 between undergraduate and master's students at EUI-Sant Pau during the 2020-2021 academic year, in order to prevent infections between patients and colleagues. The secondary objective was proposed to analyse the impact of the lock-down because of the infection on academic activity.

Method

Study Design

This is an observational, descriptive and prospective study.

Population and field of study

EUI-Sant Pau Bachelor degree and Master's students diagnosed with COVID-19. On September 7th, 2020, the EUI-Sant Pau presented the COVID-19 protocol prepared together with the Occupational Health Department of the HSCSP and to all EUI-Sant Pau undergraduate and master's students through the school's website and the virtual platform, which described the mandatory preventive measures during the 2020-2021 academic year to prevent the transmission of COVID-19. Moreover, all undergraduate students received a two-hour training session before the start of placements. This training, which was conducted by professionals from the Occupational Health Department, was intended to make students integrate skills in occupational health and safety necessary to carry out placements safely in the context of the pandemic.

Variables

Socio-demographic data, date of onset of symptoms, symptomatology, presumed source of infection, date of PCR and/or ART (antigen rapid test) and result, evolution, days of confinement and resolution, as well as data on the impact on academic activity (days of internships lost due to infection and number of incidents in practical subjects).

Data Collection

Students had to notify the responsible teacher of the placement via a newly created EUI-Sant Pau official email address if they presented symptoms compatible with COVID-19 or if they were in close contact with a person who had tested positive. If the diagnosis of COVID-19 was confirmed, the students filled in a Google form questionnaire to gather data from the aforementioned variables. A regular student follow-up was performed when they rejoined the placements, and if they had symptomatology compatible with COVID-19 after a negative screening PCR or once their placements had started. A follow-up of first year undergraduate students with positive test or suspicious symptomatology was also carried out in the same manner.

Every responsible teacher of the placements informed the health centres and clinical collaborator of every suspicious cases or positive tests, so that the appropriate measures could be taken.

All bachelor's and master's students were informed at the beginning of the academic year by the bachelor's degree coordinator, as well as by the course coordinators about the importance for patient's and health staff safety of completing this questionnaire if they had any symptoms.

Data Analysis

A descriptive statistical analysis of simple tabulation of frequencies, together with as well as mean and standard deviation were carried out to analyse the demographic characteristics and other characteristics of the students.

To estimate whether the students had been infected more or less frequently than the general population, the mean cumulative incidence at 7 days during the period studied was calculated per 100,000 people, both in the students and in the 20-29 age group of the general population in the city of Barcelona [10,11].

To compare the incidence of COVID-19 between undergraduate and master's students, the Fisher test was used.

Ethical Considerations

The students received information on the objectives of the study and gave their consent to participate. The treatment, communication and transfer of personal data of the participants were accepted by Regulation (EU) No. 2016/679 and in Organic Law 3/2018, of December 5, on the Protection of Personal Data and Guarantee of Digital Rights. The study received the approval of the Clinical Research Ethics Committee of the HSCSP.

Results

Incidence and Clinical Data on Infection

In September 2020, 351 students enrolled in the nursing degree, and 145 in the 7 master's degrees taught at EUI-Sant Pau, that is 496 students in total. The incidence of COVID-19 infections was collected from September 15, 2020 to June 30, 2021.

From the total number of students enrolled, 49 were infected [47/351 undergraduate students (13.4%) and 2/145 master's students (1.37%), $p<0.001$], 9.8% (49/496) over the total number of students during the entire analysed period. Out of these 49, 42 (85.7%) were women and 7 (14.2%) men with a mean age of 21.7±3.8 years.

The mean cumulative incidence at 7 days in students during the period analysed was 240.7 weekly cases per 100,000 people whereas in the general population it was 187.1 weekly cases per 100,000 inhabitants.

Hundred per cent of the students received training on prevention measures against COVID-19 and 80% received additional specific training in the case of rotating through COVID-19 environments.

Table 1 shows the socio-demographic characteristics of the students at the time of contagion. Most of the students (87.8%) lived in the family nucleus at the time of infection and a large part of the infections occurred among third-year students. The main source of contagion, as identified by the students, was within the family nucleus itself in 32.6% of cases, followed by patients with 14.3%. It should be noted that almost 45% of the students did not know where they were infected.

Characteristics of students infected with COVID-19	n=49
Who did they live with at the time of infection?	
Family home	43 (87.8%)
Roommates	4 (8.1%)
Partner	2 (4.1%)
Enrolled Course	
First	2 (4.1%)
Second	12 (24.4%)
Third	24 (49%)
Fourth	9 (18.3%)
Master's degree/Specialized training course	2 (4.1%)
Employment situation	
Combine work and studies Studies	23 (47%) 26 (53%)

Table 1: Characteristics of students infected with COVID-19.

The test for the diagnosis of COVID-19 was PCR in 87.7% of the cases followed by ART in the remaining 12.2% (Table 2).

Infection data of students	n=49
SARS-CoV2 infection detection system	
PCR	43 (87.7%)
ART	6 (12.2%)
Place where PCR /ART was performed	
Occupational health of the Hospital	11 (22.4%)
Primary care centre corresponding to the student	32 (65.3%)
Occupational health from another internship centre	4 (8.1%)
Particular	2 (4.1%)
Environment at the time of infection	
Clinical practices	20 (40.8%)
Internships and work	5 (10.2%)
Face-to-face theory	8 (16.3%)
Online theory	8 (16.3%)
Worked	3 (6.1%)
He doesn't know	4 (8.2%)
Presumed source of contagion	
Patients	7 (14.3%)
Familiar	16 (32.6%)
Internship partners	4 (8.2%)
He doesn't know	22 (44.9%)
Symptomatology	
Yes	39 (79.6%)
No	10 (20.4%)

Table 2: Infection data of students.

Figure 1 shows the most frequent symptoms. Headache, anosmia, and dysgeusia were the most prevalent (60% of cases), followed by cough, asthenia, rhinorrhoea, fever, and arthromyalgia. No students required hospital admission.

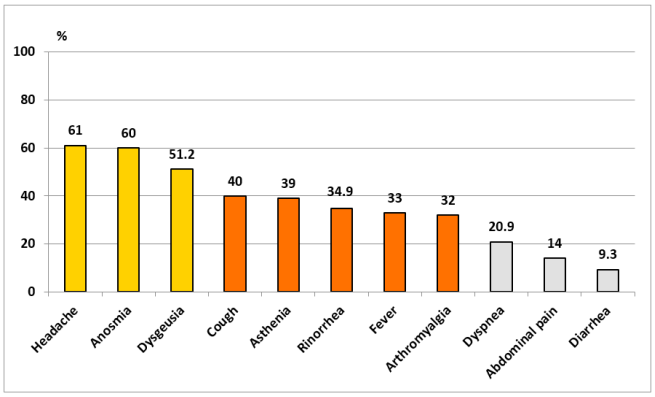

Figure 1: Most frequent symptoms among students with COVID-19.

Figure 2a shows the positive reported cases and close contacts of the students compared with the incidence in the same age group in the population of Barcelona (Figure 2b) [11].

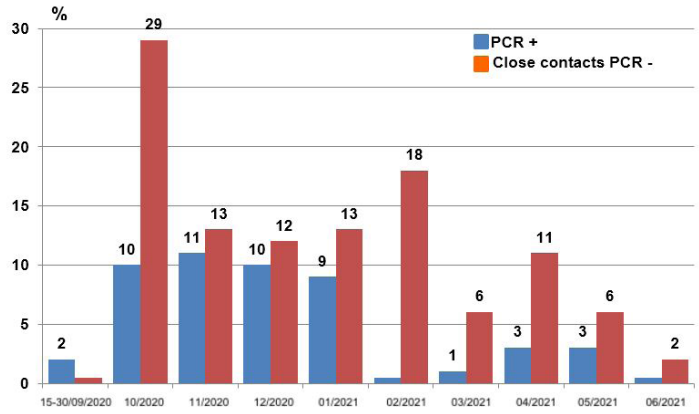

Figure 2a: Cases and close contacts of COVID-19 among students.

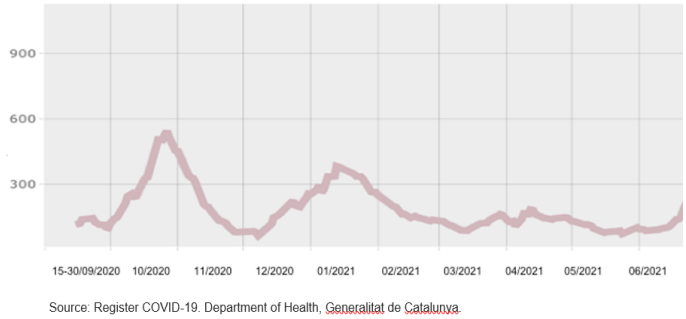

Figure 2b: Cumulative incidence at 7 days/100,000 inhabitants in the general population of Barcelona in the same age group.

One hundred ten close contacts were recorded in 96 students (13 students had more than 1 contact) with a negative PCR result. These students were also withdrawn from placements and confined pending test results. The reasons for close contact were in order of frequency: family members, outbreaks in the practice units and fellow trainees, among others.

From the end of February to June 2021, 153 students (47 second, 64 third, 39 fourth and 3 master's students) were vaccinated with the first dose of the Astra-Zeneca vaccine according to the guidelines the health authorities established in that moment for this group and age group [12]. The rest of the students who were also working in the health sector received the vaccine at the centre where they carried out their work activity.

Impact on academic activity

More than half of the students 27/49 (55.1%) combined studies and work during the academic year, and 60% did in the health sector.

Table 3 shows the number of students diagnosed with COVID-19 in the placement periods. From the 49 students who

became infected, 45 (91.8%) were enrolled in clinical placements and amongst these, 27 (60%) got infected at the time of the placement. The mean number of days of confinement among the students who became infected was 14.6 ± 5.2 days. Due to the confinement during the placements, 15 of these 27 students (55.5%) had to carry out a compensatory evaluation activity due to the impossibility of carrying out the placements on missed days in on different dates. The evaluation activity consisted in a reflective practice essay based on an article.

Table 3: Number of students with COVID-19 in the 2020-2021 practical period who had to carry out compensatory activity.

Course n=45	Practicum	No. of students COVID-19 +	Compensatory activity*
Second n=12[a]	Practicum I (socio-sanitary and hospital field)	1	1
	Practicum II (hospital setting)	0	-
	Practicum III (primary care)	7	3
Third n=24[b]	Practicum IV (hospital setting)	0	-
	Practicum V (primary assistance)	6	6
	Practicum VI (geriatrics and mental health)	4	-
	Practicum VII (critical and maternal-infant)	0	-
Fourth n=9[c]	Practicum VIII (all areas)	9	5

[a]8 of 12 (66.6%) 2nd year students were COVID-19 + during the internship period

[b]10 of 24 (41.6%) 3rd year students were COVID-19 + during the internship period

[c]9 out of 9 (100%) 4th year students were COVID-19 + during the internship period

[*]Students who missed more than 5 days of practices (Clinical Practice Framework Document, justified absences section)

Discussion

This is the first study to present results on the prospective registration and monitoring of the incidence of COVID-19 infections among nursing students at a university school in Spain.

The mean cumulative incidence at 7 days during the analysed period was 28.6% higher among nursing students than among the same age group in the general population [10,11]. This fact may be due both to a greater exposure to the virus in the workplace because it is a group that was at risk (internships in the hospital, primary and social health centres) [13], and to a greater performance of diagnostic tests among students, although we have not been able to evaluate the latter possibility with the available data.

The highest number of infections was concentrated in third-year students. These students, together with the fourth-year students, had a greater number of weeks of internships, so they may have been more exposed to contagion [13]. However, the family was the main known source of contagion, as 88% of the students lived in the family environment. Only 7 (14.7%) were infected from patients. Taking into account that the students were carrying out internships in risky environments, the fact that infections were lower in these environments could be explained by the measures that the students took during the internships and the previous training received.

The percentage of undergraduate students who became infected was significantly higher than in master's students. This could be due to the fact that master's students had completed nursing degree studies, in addition to having greater work experience and knowledge about prevention measures (in these last).

PCR was the most used diagnostic test. During the 2020-2021 academic year, ART was not available in pharmacies and it was the primary care centres that decided whether to perform ART and PCR simultaneously or only ART, depending on availability and the criteria used at that time [14,15].

No student required hospital admission and the symptomatology was similar to the general population, which in most cases was mild as described in this age group [16,17], and has remained so in the following waves of the pandemic despite the fact that, the latter, has been the most affected group [4,18] by omicron.

In the EUI-Sant Pau, the prospective registration of the infection continues and with the omicron [19] variant between

the months of December and January 2022, 56 students have been infected, which represents an average of 28 infections/month (results not published), compared to 5.1 infections/month during the 9.5 months of the 2020-2021 academic year study.

The infections followed a pattern similar to that of the waves registered in the general population throughout the academic year [11]. Most of the infections coincided in the first four months corresponding to the second wave of the pandemic [11]. It should be noted that no contagion was recorded during the Christmas holiday period. Most likely, the students did not report the new cases during these dates because they did not affect the academic activity and therefore the number of infections during this time could be underestimated. Although in February, 18 students were in close contact and the vast majority presented symptoms compatible with COVID-19, this was never demonstrated (negative PCR), which translated into the result that no case of infection was recorded among the students during that month.

In March, following the instructions of the Department of Health, vaccination began among the students, starting with the third and fourth grade students (who were in training and a large majority were doing health care) and they entered into the vaccination programme as hospital workers. From this moment on, contagions decreased, reproducing what was happening happened in the general population [20].

The 2020-2021 academic year was marked by hybrid teaching for theoretical classes (face-to-face-/online). Regarding practices, seminars, workshops and evaluation activities, attendance was compulsory [5]. In the case of the first (theory throughout the course) and fourth grade (theory during the first two months), an attempt was made to maintain face-to-face teaching following the UAB instructions and guaranteeing the maximum occupancy of the classrooms as established for said instruction at all times. This employability was modified (50-70%) depending on the different waves of the pandemic and the risk of infection [5,21]. Class attendance in person decreased throughout the course, with periods in which, of the two classrooms set up for each of these two courses, only one was used, with attendance well below the established percentage. A large majority of students chose to follow the classes via streaming, thus following a learning methodology that had already been established since the start beginning of the pandemic [22,23].

Regarding the days of confinement, the health guidelines were initially followed [24,25], establishing periods of 14 days. Students who missed more than 5 days of internships for just cause (clinical practice framework document of the school) and who could not make up the days in the same centre (coincidence with other internships and restriction of the number of places due to the pandemic), presented a compensatory activity at the discretion of each person responsible for the pilot. During the month of September of the 2020-2021 academic year, a clinical internship period (period 0) was established for students starting the fourth year who, as a result of the confinement during the months of March to May 2020, lost weeks of internships. With this measure, we ensured that we complied with Community Directive 2013/55/EU, which recommends carrying out 2,300 hours of clinical practice during undergraduate training [6], as well as with the commitment to complete the training with the highest quality guarantee.

This study has a number of limitations. In the first place, the analysis of the impact on the academic activity was conditioned by the different confinement criteria dictated by the practice centres (primary care, socio-health or hospital settings). To minimize this effect, the criterion of reincorporation to practices was followed according to the indications of the occupational health service of our centre (14 days after the PCR + if there were no symptoms). Secondly, only the impact on the academic activity of not attending practices has been analysed but not the consequences of not attending theoretical classes in person.

Finally, the impact and work overload of the prospective and close follow-up carried out by the professors responsible for the practical subjects to guarantee the safety of patients, students and healthcare teams have not been evaluated (either).

Conclusions

The incidence of infections among nursing students was higher than that of the general population of the same age. Prospective monitoring has made it possible to take urgent measures to cut the chain of infections between students and patients and thus guarantee the safety of the latter. Those students who missed more than five days of practices due to the infection, presented a compensatory activity appropriate to the skills of the practicum they were doing at that time.

The EUI-Sant Pau adapted the academic calendar so that all the students who were affected by the confinement could complete their training in the external internship hours as established by the mandatory European guideline for nursing degree studies.

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