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Safety and education during COVID-19: prevalence, associated factors and reopening plans of the School of Nursing

Segurança e educação durante a COVID-19: prevalência, fatores associados e planos de reabertura da Faculdade de Enfermagem

Seguridad y educación en COVID-19: prevalencia, factores asociados, planes de reapertura en una Facultad de Enfermería

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Abstract

Objective: to analyze the prevalence and factors associated with COVID-19 screening and propose the necessary strategies for the reopening of university Nursing Schools to face-to-face classes. **Methods**: aa cross-sectional study was designed from the baseline of a longitudinal Internet-based survey of a Brazilian School of Nursing. With the ordinal outcome (COVID-19 operational classification), data analysis was conducted using a multinomial regression model **Results**: a total of 498 participants were included in the analysis and revealed 67.27% suspected and 11.65% confirmed cases of COVID-19. Wearing masks, public transportation, and being part of frontline healthcare workers were statistically associated with a positive history for COVID-19. **Conclusion**: plans to reopen Nursing Schools must integrate the use of personal protective equipment, public transportation, and COVID-19 screening into education.

Keywords: Universities; Safety; Nursing; Coronavirus infection; Pandemics.

Resumo

Objetivo: analisar a prevalência e os fatores associados à triagem da COVID-19 e propor as estratégias necessárias para a reabertura das Escolas de Enfermagem universitárias para as aulas presenciais. **Métodos**: um estudo transversal foi projetado a partir da linha de base de uma pesquisa longitudinal baseada na Internet de uma Escola Brasileira de Enfermagem. Com o resultado ordinal (classificação operacional COVID-19), a análise de dados foi conduzida usando um modelo de regressão multinomial. **Resultados**: um total de 498 participantes foi incluído na análise e revelou 67,27% de casos suspeitos e 11,65% de casos confirmados de COVID-19. O uso de máscaras, o transporte público e fazer parte da linha de frente dos trabalhadores da saúde foram estatisticamente associados a um histórico positivo para a COVID-19. **Conclusão**: os planos de reabertura de Escolas de Enfermagem devem integrar o uso de equipamentos de proteção pessoal, o transporte público e a triagem da COVID-19 na educação.

Palavras-chave: Universidades; Segurança; Enfermagem; Infecção por Coronavírus; Pandemias.

Resumen

Objetivo: analizar la prevalencia y los factores asociados al rastreo de COVID-19 y proponer las estrategias necesarias para la reapertura de Escuelas Universitarias de Enfermería para clases presenciales. **Métodos**: se diseñó un estudio transversal a partir de la línea de base de una investigación longitudinal basada en Internet de una Escuela Brasileña de Enfermería. Con el resultado ordinal (clasificación operativa COVID-19), se realizó el análisis de datos mediante un modelo de regresión multinomial. **Resultados**: se incluyeron en el análisis un total de 498 participantes que revelaron el 67,27% de los casos sospechosos y el 11,65% de los casos confirmados de COVID-19. El uso de máscaras, el transporte público y ser parte de la primera línea de los trabajadores de la salud se asociaron estadísticamente con un historial positivo de COVID-19. **Conclusión**: los planes de reapertura de Escuelas de Enfermería deben integrar el uso de equipos de protección personal, transporte público y el rastreo de COVID-19 en la educación.

Palabras clave: Universidades; Seguridad; Enfermería; Infección por coronavirus; Pandemias.

INTRODUCTION

With the declaration of the *new Coronavirus pandemic* (COVID-19) by the World Health Organization (WHO), a set of actions aimed at reducing the speed of progression of the epidemiological curve was initiated by the scientific community and international organizations.[1,2] Therefore, physical distance was the main method of containing the pandemic at the time.[3,4]

Due to the high risk of contagion among people, the pandemic quickly led to the closure of public places and educational institutions worldwide.[5] In an attempt to minimize the impact of losses associated with the interruption of education activities in universities, the use of teaching/learning strategies mediated by digital platforms has been developed, thus constituting an ongoing pedagogical challenge for both university faculty and students. This reality demands a risk assessment of the possibilities of returning to on-site classroom and clinical activities with undergraduate nursing students.

Discussion of the susceptibility of children and young adults in the COVID-19 transmission chain accentuated the need for decision making pertaining to the reopening of schools and universities and in the individual decision to adopt or not the health strategies to prevent contagion.[6-10] Beyond science, denial and misinformation as a policy took place in some countries, including Brazil.[11,12] Additionally, there were key failures by the Brazilian Federal Government in tracking the disease and in providing coordinated care to patients.[3,13] Despite the fact that Brazil is one of the countries with a high number of COVID-19 cases and deaths and a poor ability to flatten the epidemiological curve of the disease, much discussion and conflict occurred related to the return to face-to-face classes.

Additionally, the seroprevalence rate among faculty, staff and students in Brazilian universities especially in health professional courses, such as Schools of Nursing, is not known. Studies on this topic can add crucial knowledge to help shape public policy. This purpose of this paper is to analyse the prevalence and associated factors to COVID-19 screening, and to propose the necessary strategies for the reopening of university-based Schools of Nursing for onsite classes and clinical laboratories.

METHODS

This cross-sectional study is based on the baseline of the research "COVID-19 Pandemic and academic life: cohort on the disease situation, social conditions and academic experiences", and the article followed the recommended guidelines.[14,15] The research was conducted at a university-based School of Nursing located in Rio de Janeiro, a program which holds an important place among undergraduate and graduate level nursing programs in Brazil.

An internet-based survey was designed for this study with a subset analysing the period from June 4th to September 3th, 2020. The target population was the academic community of the School of Nursing including faculty, administrative staff and students. A convenience sample was used for all faculty, administrative staff and students who had a formal relationship with the School of Nursing during the baseline period. Potential study participants were 326 undergraduate students, 410 students completing specialization courses, 88 graduate (masters and doctoral level) students, 104 nursing faculty and 26 administrative staff, totalling 954 potential participants.

Recruitment occurred in two phases and targeted faculty, administrative staff, and students officially attached to the School of Nursing. In the first phase of data collection, a cover letter explaining the study, a link to informed consent, and the data collection instruments were sent to potential participants via their institutional e-mail. In cases of non-response and after three days, a new email was sent. Subsequently, the research team made telephone contact to invite potential participants who, after two attempts, did not complete the web-based survey. Additional telephone contact was attempted every third day at different times during the day and evening, including weekdays and weekends. Upon acceptance of participation, the link to the online instrument was again forwarded by email, constituting the second phase of data collection. If potential participants did not complete the survey, a new email was sent. After five contact attempts, with three emails and two phone contact attempts, potential participants who did not respond were excluded from the study. A total of 498 participants responded to the instrument and constituted the final survey sample.

To prevent multiple entries by the same participant and considering the impossibility of IP blocking due to the sharing of computers by many students, the data collection instrument contained information (full name, e-mail address, and other data) that made it possible to double-check it with institutional databases. In order to guarantee information integrity, the database was stored encrypted and without personal information. A daily backup was performed to prevent data loss and to remove storage from the internet network.

The COVID-19 case definition used in this study is the case operational classification adopted by the Brazilian Ministry of Health.[16] Participants who reported a history of either testing or clinical-epidemiological criteria confirmation were considered *confirmed cases*.

Testing confirmation criteria were: A Molecular Biology test (RT-PCR in real time) with a detectable (positive) result for SARS-CoV-2 in a clinical sample collected between the 4th and the 10th day, or an Immunological Test (classic serology or rapid test) with positive IgM or IgG results in samples collected after the seventh day. In cases lacking laboratory confirmation, the clinical-epidemiological criteria were: reporting of home or close contact with a person with a SARS-CoV-2 positive test in the previous 7 days of the onset of symptoms.

A suspect case definition was adopted for individuals who tested inconclusive or did not undergo Molecular Biology, Classical Serology, or Rapid Test and had symptoms consistent with respiratory syndrome (influenza syndrome and Severe Acute Respiratory Syndrome) with no history of contact with a person confirmed for SARS-CoV-2 within seven days prior to symptoms.

Outcome variables were composed of the set of clinical respiratory manifestations, the COVID-19 diagnostic test and the positive history of confirmed contact, and consequently the respective time intervals as indicated in the operational definition of the case by the Brazilian Ministry of Health. The covariables investigated in this study were composed of sociodemographic, clinical and health characteristics. A positive risk group was considered when the participant reported positive history in one or more of these characteristics: age over 60 years, pregnancy, postpartum, obesity and chronic conditions (heart disease, diabetes, liver disease, neuropathy, immunodeficiency, nephropathy, cancer, and chronic respiratory diseases).

The prevalence and the respective 95% confidence intervals were calculated for the case definitions of COVID-19 (discarded, suspected and confirmed), and for the classification of confirmed cases, such as confirmed by laboratory examination and confirmed by clinical-epidemiological criteria.

Bivariate analyses were performed based on the estimation of crude Odds Ratio (cOR), using the chi-square as a hypothesis test. All variables with p-value <0.20 were included in the initial regression model, applying multinomial regression as a technique for estimating the factors associated with the outcome. From the initial model, a stepwise backward technique was applied, removing individually non-significant covariables until reaching the final models (with all variables with a p-value <0.05). For the global assessment of the model's adjustment, the Wald Test was used. The analysis and processing of the database was performed using the software Stata SE 15.[17]

The research was conducted according to the ethical principles involving human beings, in compliance with international and Brazilian legislation and approved by the IRB (Institutional Review Board) Research Ethics Committee of the University (Approval number: 4.058.958). All participants agreed to participate by signing the electronic authorization of Informed Consent.

RESULTS

In total, 498 of 954 potential participants completed the electronic questionnaires, resulting in a response rate of 52.20%. When analyzing the population subgroup, the following response rates were observed: 76.38% (n=249/326) for undergraduate students; 28.53% (n=117/410) for specialization students; 36.26% (n=32/88) for master's and doctoral students; 80.76 (n=84/104) for faculty; and 61.53% (n=16/26) for administrative staff.

The sample was composed predominantly of women (n=444; 89.16%), white (n=251; 50.50%), with an average age of 30.15 years (SD 11.53), who reside in the capital of the state of Rio de Janeiro (n=352; 70.68%), with individual income up to US$544.47 per month (n=304; 62.42%), and living (on average) with 0.77 (SD 0.65) people per room in the house. The clinical characteristics of the sample indicate that 41.97% (n=209) of the participants are in the risk group for COVID-19 and that 63.86% (n=318) of them live with a family member considered to be at risk. In addition, 57.63% (n=287) of the sample has private health insurance on top of public health insurance.

Specifically, on health measures and exposure during the COVID-19 pandemic, 67.87% (n=338) of the participants were working from home offices, 42.97% (n=214) received or visited family members and friends, 72.29% (n=360) used public transport to get to the University and other work settings, and 96.79% (n = 482) reported always using masks. In addition, 29.92% (n = 149) of the participants were active as clinical healthcare workers in direct patient care, on average of 1.04 (SD 1.72) days per week.

Figure 1 shows COVID-19 cases according to the operational classification. It is noted that 67.27% (n=335; CI 95%: 63.01 - 71.26) of the sample was classified as suspected case, 21.08% (n=105; CI 95%: 17.71 - 24.90) as negative case, and 11.65% (n=58; CI 95%: 9.10 - 14.78) as confirmed cases of COVID-19. Based on a more specific classification, it is possible to extract two subsets of confirmed cases: 7.63% (n=38/498; CI 95%: 5.59 - 10.32) with laboratory test confirmation and 4.02% (n=20/498; CI 95%: 2.60 - 6.15) confirmed by clinical-epidemiological criteria.

Based on these findings, attention is drawn to the proportion of people tested for COVID-19: 24.79% (n = 123; CI 95%: 21.10 - 28.69). Of the participants who reported respiratory syndrome (n=395; 79.31; CI 95%: 75.52 - 82.66), only 17.97% (n=71/395; CI 95%: 14.48 - 22.09) reported an examination history for COVID-19. Of the participants with Severe Acute Respiratory Syndrome (n = 27/498; 5.42%; CI 95%: 3.74 - 7.80), nine (33.33%) reported laboratory tests for COVID-19. It is worth noting that 23 participants (4.62%; CI 95%; 3.08 - 6.86) reported chest tomography. Of these, three reported images compatible with viral pneumonia and also presented a positive laboratory test for COVID-19, being omitted from the flowchart in Figure 1.

Tables 1 and 2 present the prevalence of the case classification and associated sociodemographic, clinical and sanitary factors to confirmed and discard COVID-19 cases. The highest prevalence of suspected cases, and consequently the highest cOR, are associated with the variables of race/ethnicity, gender, the lowest levels of academic training and lowest income, as well as being associated with the variable's homework (p <0.001), healthcare frontline workers with direct patient care (<0.001) and days of the week in healthcare frontline direct patient care (<0.001), and use of masks (p 0.004). The lowest prevalence of cases was found among undergraduate students (4.02%), while students completing nursing specialization programs had the highest prevalence of COVID-19 (25.64%).

Finally, Table 3 shows the final model of multinomial regression. The use of public transport reduced the effect on discarded cases (aOR 0.54; p 0.016). This means that when using negative cases as a reference, aOR is 1.80 (CI95% 1.10 - 2.93; p 0.019). It is noted, considering that the sample showed the overwhelming predominant use of masks, that it was only possible to calculate the effect of the variable on the ratio of suspected cases/discarded cases, showing aOR 5.19 (p 0.008). Finally, variable participation in direct care work in frontline health care showed a statistically significant effect for the two response categories: suspected case/discarded case (2.91; p <0.001) and suspected case/

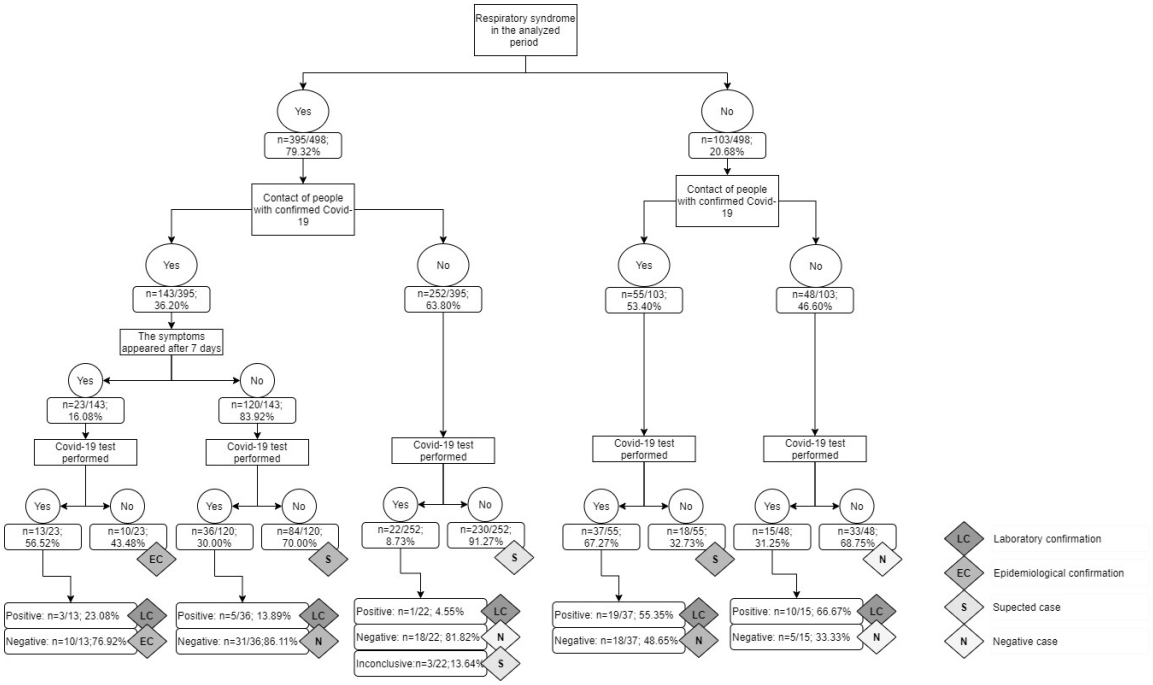

Figure 1. Covid-19 cases according to the operational classification of the study and according to clinical manifestations, home contact with confirmed cases, the performance and the result of diagnostic tests.
Legend: LC: Laboratorial confirmation; EC: Confirmation by clinical-epidemiological criteria; S: Suspected Case; N: Negative (discarded) case.

confirmed case (7.83; p <0.001). No interactions were identified from this model.

DISCUSSION

This study is the first to present data from COVID-19 screening at a Brazilian School of Nursing, showing that the prevalence of confirmed cases (history of positive test and home contact with COVID-19 case) was circa 11%. These findings are compatible with other international studies, whose seroprevalence of SARS-CoV-2 was between 1 and 10%.[18-22] However, the data from this study differs from other studies based on the Brazilian population.

In Rio de Janeiro, between April 14-27, research was carried out, finding crude prevalence 4.0% (95% CI 3.3 - 4.7) of anti-SARS-CoV-2 in 2,857 blood donors. Adjusted estimates resulted in a prevalence of 3.3% (95% CI 2.6 - 4.1) after applying the weights for the population of the State of Rio de Janeiro, and after adjustment for the sensitivity and specificity of the tests.[23] Similar estimates were found in a serial cross-sectional study conducted in 11 municipalities in the neighbouring Brazilian state of Espírito Santo, showing the prevalence of 2.1% (95% CI 1.67 - 2.52) in 6,393 tested persons.[24] Two household and consecutive seroprevalence surveys conducted in 133 sentinel cities in all Brazilian states resulted in 1.39% positive cases (347/24,995) and 2.40% (746/31,128) in both investigations, respectively.[25] This study estimated 7.5% (95% CI: 4.2 and 12.2%) of the cases of COVID-19 for Rio de Janeiro and presented results closer to the general conclusions found.

Some situations can help to understand these differences in prevalence. The first situation is the heterogeneous characteristic of distribution of the disease, being affected by population characteristics and health systems organization.[25] The second situation may be the multiplicity of diagnostic tests used in the studies, which naturally produce different measures depending on the precision of the tests. However, it is believed that the main situation to be considered is that the results of this study show measures of groups with different exposures.

Notably, approaching the results of this study are undergraduate students (4.02%) with prevalence found in national and international population-based research.[22-26] Students have been without on-site classes and maintaining social distancing, and others public health practices since the beginning of the COVID-19 pandemic.[23-25] The same is true for the administrative staff, who were not exposed to the risks of healthcare units. Thus, it is believed that the risks of contagion of these two groups are similar to the risks of the general population.

The effect of mask use on the higher prevalence of confirmed cases should not be interpreted in the light of causality and risk of infection. It turns out that the use of this protective equipment, as it is known to reduce the risk of infection, also reduces the probability of suspected cases occurrence. Thus, in addition to the obvious gains in preventing infection, the equipment also contributes to the scrutiny of cases in the face of symptoms compatible with the disease.

In addition to the use of masks, which were considered necessary since the beginning of the pandemic, the performance in healthcare front-line also demonstrated effects on the confirmed

Table 1. Prevalence and crude odds ratio of suspected cases versus confirmed and discarded Covid-19 cases by sociodemographic characteristics.

Variable	Suspected case	Discarded case			Confirmed case		
	n (%)	n (%)	cOR (CI 95%)*	P	n (%)	cOR (CI 95%)*	P
Age: Mean (SD)	29.63(12.04)	30.34(10.70)	1.00 (.98 – 1.02)	0.572	32.81 (9.65)	1.02 (.99 – 1.04)	**0.054**
Race / ethnicity		-	-	-	-	-	-
Black	168 (69.71)	44 (18.26)	1.00	-	29 (12.03)	1.00	-
White	165 (65.74)	60 (23.90)	1.39 (0.89 – 2.16)	**0.148**	25 (10.36)	0.91 (0.51 – 1.62)	0.754
Asian / Indigenous	1 (20.00)	1 (20.00)	3.82 (0.23 – 62.26)	0.347	3 (60.00)	17.38 (1.74-172.86)	**0.015**
Gender							
Woman	304 (68.47)	87 (19.59)	1.00	-	53 (11.94)	1.00	-
Man	31 (57.41)	18 (33.33)	2.03 (1.08 – 3.80)	**0.027**	5 (9.26)	0.92 (0.34 – 2.49)	0.877
Academic category							
Undergraduate students	194 (77.91)	45 (18,07)	1.00	-	10 (4.02)	1.00	-
Specialization students	56 (47.86)	31 (26.50)	2.39 (1.38 – 4.11)	**0.002**	30 (25.64)	10.39 (4.79 – 22.56)	**<0.001**
Master doctoral students	16 (50.00)	10 (31.25)	2.69 (1.15 – 6.32)	**0.023**	6 (18.75)	7.27 (2.34 – 22.59)	**0.001**
Professors	56 (66.67)	18 (21.43)	1.38 (0.74 – 2.58)	0.304	10 (11.90)	3.46 (1.37 – 8.74)	**0.009**
Technicians	13 (81.25)	1 (6.25)	0.33 (0.04 – 2.60)	0.294	2 (12.50)	2.98 (0.59 – 15.06)	**0.186**
Residence area							
Capital	101 (69.18)	30 (20.55)	1.00	-	15 (10.27)	1.00	-
Other municipalities	234 (66.48)	75 (21.31)	1.07 (0.66 – 1.75)	0.758	43 (12.22)	1.24 (0.66 – 2.33)	0.509
Income (in dollar)**							
Up to $181.49	169 (78.24)	37 (17.13)	1.00	-	10 (4.63)	1.00	-
$181.50 to $544.47	47 (53.41)	25 (28.41)	2.43 (1.33 – 4.43)	**0.004**	16 (18.18)	5.75 (2.45 – 13.51)	**<0.001**
$544.48 to $807.46	48 (64.00)	13 (17.33)	1.24 (0.61 – 2.51)	0.556	14 (18.67)	4.93 (2.05 – 11.79)	**<0.001**
$807.46 to $1,814.91	43 (58.11)	17 (22.97)	1.80 (0.93 – 3.51)	**0.081**	14 (18.92)	5.50 (2.29 – 13.24)	**<0.001**
More than $1,814.91	19 (55.88)	11 (32.35)	2.64 (1.16 – 6.02)	**0.021**	4 (11.76)	3.56 (1.01 – 12.45)	**0.047**

***** Crude Odds Ratio (cOR) was calculated using the suspected cases as reference. ****** The conversion of values was carried out on Sep 24th, 2020 and used the quotation from $ 1.00 to R$ 0.18.

cases prevalence.[27,28] This result corroborates with the COVID-19 prevalence among registered nurses (specialization students, master's and doctoral students and faculty), being higher than the general results of this study. A prospective study carried out in the USA compared front-line healthcare workers with the general U.S. population, demonstrating a higher risk of infection among healthcare professionals - HR 11.61, 95% CI 10.93-12.33.[29] A similar situation was identified in a cross-sectional study of immune seroconversion among direct health care providers in a maternity setting, demonstrating that seroconversion was probably

Table 2. Prevalence and crude odds ratio of suspected cases versus confirmed and discarded Covid-19 cases by clinical and sanitary characteristics.

Variable	Suspected case	Discarded case			Confirmed case		
	n (%) or mean (SD)	n (%) or mean (SD)	cOR (IC 95%)*	P	n (%) or mean (SD)	cOR (IC 95%)*	P
Risk group							
No	196 (67.82)	59 (20.42)	1.00	-	34 (11.76)	1.00	-
Yes	139 (66.51)	46 (22.01)	1.10 (0.71 – 1.71)	0.675	24 (11.48)	0.99 (0.56 – 1.75)	0.987
Family member of risk group							
No	118 (65.56)	40 (22.22)	1.00	-	22 (12.22)	1.00	-
Yes	217 (68.24)	65 (20.44)	0.88 (0.56 – 1.39)	0.593	36 (11.32)	0.89 (0.50 – 1.58)	0.691
Health insurance							
No	145 (68.72)	42 (19.91)	1.00	-	24 (11.37)	1.00	-
Yes	190 (66.20)	63 (21.95)	1.14 (0.73 – 1.79)	0.553	34 (11.85)	1.08 (0.61 – 1.90)	0.787
Visited family or friends							
No	188 (66.20)	62 (21.83)	1.00	-	34 (11.97)	1.00	-
Yes	147 (68.69)	43 (20.09)	0.89 (0.57 – 1.38)	0.597	24 (11.21)	0.90 (0.51 – 1.59)	0.723
Homework							
Yes, or unemployed	264 (78.11)	58 (17.16)	1.00	-	16 (4.73)	1.00	-
No; reduced working range	32 (41.56)	23 (29.87)	3.27 (1.78 – 6.00)	**<0.001**	22 (28.57)	11.34 (5.41 – 23.80)	**<0.001**
No; normal working range	39 (46.99)	24 (28.92)	2.80 (1.56 – 5.01)	**0.001**	20 (24.10)	8.46 (4.04 – 17.71)	**<0.001**
Healthcare frontline							
No	269 (77.08)	61 (17.48)	1.00	-	19 (5.44)	1.00	-
Yes	66 (44.30)	44 (29.53)	2.94 (1.83 – 4.71)	**<0.001**	39 (26.17)	8.37 (4.54 – 15.41)	**<0.001**
Days of the week in healthcare frontline: Mean (SD)	0.67 (1.48)	1.50 (1.88)	1.34 (1.18 – 1.51)	**<0.001**	2.34 (1.88)	1.64 (1.41 – 1.91)	**<0.001**
Person per room: mean (SD)	0.77 (0.65)	0.74 (0.36)	0.90 (0.59 – 1.37)	0.635	0.78 (0.96)	0.99 (0,66 – 1.50)	1.000
Use public transportation (bus, train, boat, etc)							
No	80 (57.97)	38 (27.54)	1.00	-	20 (14.49)	1.00	-
Yes	255 (70.83)	67 (18.61)	0.55 (0.34 – 0.89)	**0.014**	38 (10.56)	0.60 (0.33 – 1.08)	**0.089**
Use of mask							
Always	328 (68.05)	96 (19.92)	1.00	-	58 (12.03)	1.00	-
Most of the time	7 (43.75)	9 (56.25)	4.39 (1.59 – 12.11)	**0.004**	-	-	-

***** Crude Odds Ratio (cPR) was calculated using the suspected cases as reference.

associated with professional performance and not necessarily to professional performance scenario.[30]

Following the WHO and despite representing losses in the acquisition of practical skills, the reduction of exposure in care practice settings must be considered in future school reopening plans, especially with beginning level nursing students.[31] These indisputable problems in nursing education must be considered by universities and included in curriculum content recovery and skills acquisition plans, which must take place in-person after the end of the pandemic and after the mass vaccination of the population.

Additionally, the use of protocols among the educational institutions in order to continue the operations of classes during this unprecedented situation it is a must (Encourage the principles

Table 3. Final model of multinomial regression*.

Variable	Discarded case		Confirmed case	
	cOR (IC 95%)**	p	cOR (IC 95%)**	p
Use public transport: no/yes	0.54 (0.33 - .89)	**0.016**	0.63 (0.33 – 1.19)	0.155
Use of mask: always/most of the time	5.19 (1.54 – 17.38)	**0.008**	-	-
Healthcare frontline: no/yes	2.91 (1.77 – 4.80)	**<0.001**	7.83 (4.24 – 14.46)	**<0.001**

* The Adjusted Odds Ratio (aOR) was calculated using the suspected cases as reference. ** Statistic of the Wald Test: 58.81 (p-value <0.001).

of hygienic coughing and sneezing, physical distancing, to provide washing and waste disposal facilities, to provide a clean and well-ventilated environment, to provide masks for those who cannot afford them, to provide clear advice to students about the actions they should take if they become sick or think that they have symptoms of COVID-19). Universities must be advised to set-up a dedicated response to increase their level of preparation and response to mitigate the impact of COVID-19. The pandemic also brings the lesson of the need for greater investments in training with the self-protection of healthcare students and healthcare workers.

The relationship between infection and the use of public transportation is also an aspect to be considered, especially when we recognize the characteristics of urban groups in Brazil and in other low- and middle-income countries. It is noteworthy that a significant part of the academic community studied uses public transportation to commute from home to the university. Thus, when thinking about reopening university Nursing Schools, this also means the need to adopt an implementable plan of protective measures to reduce exposure to public transportation on the way to and from university. Examples include individual or small group accommodations and the implementation of regular and systematic symptom monitoring and testing for COVID-19 among faculty, staff, and students.

A troubling finding in this study was the low level of COVID-19 testing in the academic community studied. This finding generated a significant number of unconfirmed cases, even among the subjects who reported the respiratory syndromes. The higher prevalence of suspected cases is related to subgroups already listed in the literature such as ethnic minorities, women, and low-income groups.[32-35] The pandemic has accentuated the inequalities throughout this society, and these became more visible and affect students, professors and administrative technician at universities the same way as in general Brazilian population.[36]

It is already known that lack of infection registries and population testing are major challenges to contain the pandemic, especially in low-and middle-income regions.[37] The mathematical model proposed by Grassly and colleagues (2020) reinforces this inference by showing the effect of weekly testing by health care workers and self-isolation in the presence of respiratory syndromes as protective factors on COVID-19 infection rates. When considering the phase of clinical trial studies on the SARS-CoV-2 vaccine, any plan to reopen schools and universities, even if gradually and with restricted flow of people, must contemplate the apparent and still contradictory acquired immunity after infection.[38,39] Implementing mass screening of Covid-19, including health students' group, is an urgent and necessary action.

Thus, the results of COVID-19 screening in this study, especially among categories with less exposure to the public (students), tend to produce reflections on the low percentage of immunity to COVID-19 acquired by the population. With the possible and immediate return to face-to-face classes, outbreaks of the disease could occur inside the Schools of Nursing, breaking with the main mission of these training settings. In addition, it seems important to contextualize the high risk of spreading the disease from these academic units, especially due to the greater exposure in students who are still in training. This leads us to a dilemma: on the one hand, nurses that are also educators have the mission of caring and protecting, on the other hand, it seems essential to enforce this educational mission toward future nurses, even in risky environments.[6]

Despite the important reflections produced, the data must be interpreted in light of its limitations. The first limitation is centered on the study design and the sampling strategy. Since this was a web-based survey with convenience sampling, the possibility of selection bias should not be ruled out, especially when considering the limits of digital connectivity in Brazil. In order to circumvent this selection problem, the study included the telephone contact phase and is believed to have minimized the exclusive selection of people with good quality Internet access. The choice to adopt Google Forms as a tool to build the online questionnaire also apparently helped the responsiveness of the participants. Because it is a smooth and common application used in Brazil, this feature is also believed to have helped people with access difficulties, allowing participants to respond to the survey instrument using cell phones and tablets.

The second limitation was in the measuring the prevalence of COVID-19, which was based on the self-report of the screening of the disease, as well as the dates of the clinical manifestation, the contact with positive cases of the disease, the type and result of the diagnostic tests. Thus, in addition to the memory bias, proper to measurement items that required retrospection for answers, there is the classification problem resulting from the multiplicity of tests used in Brazil. In these cases, there is always the possibility to better classify positive cases than negative ones.

However, with the respective weightings resulting from the different population bases, it is possible to observe prevalence of 12.67% and 44.23%, respectively, of positive results in symptomatic and negative in asymptomatic patients tested. Despite the variability in the accuracy of COVID-19 diagnostic tests, the prevalence by subgroup findings are compatible with serological surveys conducted in Brazil and in the world. Despite the fact that the final model does not present associations between sociodemographic variables and the prevalence of COVID-19, it is essential that new studies can contemplate other population bases for a better scrutiny of these effects.

CONCLUSION

The study showed a prevalence of 11.65% of confirmed cases by COVID-19, varying according to academic category. The study identified that 67.27% of the sample was classified as suspected cases and 21.08% as discarded cases. However, low testing of the study participants was also observed. Only 24.79% of the population investigated had access to diagnostic testing, even those who manifested respiratory syndromes and including Severe Acute Respiratory Syndromes. Public transportation and mask use and frontline health care participation were factors associated with differences between confirmed, discarded, and suspected cases of COVID-19, possibly due to access to COVID-19 testing.

The discussion of plans to reopen nursing schools in Brazil and around the world should integrate the discussion about the use of personal protective equipment in education, as well as in practice settings. Actions to bring students closer to schools and universities, reducing travel by public transportation, are also a safety issue to be considered. Finally, although frequently performed in many countries around the world, screening for COVID-19, with increased access to laboratory testing, should be a mandatory strategy for reopening Nursing Schools.

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REFERENCES

1. World Health Organization. Rolling updates on coronavirus disease (COVID-19) [Internet]. Geneva: WHO; 2020 [cited 2020 Oct 2]. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen
2. World Health Organization. Naming the coronavirus disease (COVID-19) and the virus that causes it [Internet]. Geneva: WHO; 2020 [cited 2020 Oct 2]. Available from: https://www.who.int/emergencies/diseases/

novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(covid-2019)-and-the-virus-that-causes-it

3. Rafael RMR, Neto M, de Carvalho MMB, David HMSL, Acioli S, Faria MGA. Epidemiology, public policies and covid-19 pandemics in Brazil: what can we expect? Rev Enferm. 2020;28:1-6. http://dx.doi.org/10.12957/REUERJ.2020.49570.
4. Grassly NC, Pons-Salort M, Parker EPK, White PJ, Ferguson NM, Ainslie K et al. Comparison of molecular testing strategies for COVID-19 control: a mathematical modelling study. Lancet Infect Dis. 2020;20(12):1381-1389. http://dx.doi.org/10.1016/S1473-3099(20)30630-7. PMid:32822577.
5. Yu HJ, Hu YF, Liu X, Yao X, Wang Q, Liu L et al. Household infection: the predominant risk factor for close contacts of patients with COVID-19. Travel Med Infect Dis. 2020;36:101809. http://dx.doi.org/10.1016/j.tmaid.2020.101809. PMid:32592904.
6. McDonald CC. Reopening schools in the time of pandemic: look to the school nurses. J Sch Nurs. 2020;36(4):239-40. http://dx.doi.org/10.1177/1059840520937853. PMid:32552237.
7. Cooper DM, Guay-Woodford L, Blazar BR, Bowman S, Byington CL, Dome J et al. Reopening schools safely: the case for collaboration, constructive disruption of Pre-Coronavirus 2019 expectations, and creative solutions. J Pediatr. 2020;223:183-5. http://dx.doi.org/10.1016/j.jpeds.2020.05.022. PMid:32445649.
8. Li A, Harries M, Ross LF. Reopening K-12 Schools in the Era of Coronavirus Disease 2019: Review of State-Level Guidance Addressing Equity Concerns. J Pediatr. 2020;227:38-44.e7. http://dx.doi.org/10.1016/j.jpeds.2020.08.069. PMid:32866501.
9. Sheikh A, Sheikh A, Sheikh Z, Dhami S. Reopening schools after the COVID-19 lockdown. J Glob Health. 2020;10(1):1-3. http://dx.doi.org/10.7189/jogh.10.010376. PMid:32612815.
10. Viner RM, Bonell C, Drake L, Jourdan D, Davies N, Baltag V et al. Reopening schools during the COVID-19 pandemic: governments must balance the uncertainty and risks of reopening schools against the clear harms associated with prolonged closure. Arch Dis Child. 2021 fev;106(2):111-3. http://dx.doi.org/10.1136/archdischild-2020-319963. PMid:32747375.
11. The Lancet. COVID-19 in Brazil: "So what?". Lancet. 2020;395(10235):1461. http://dx.doi.org/10.1016/S0140-6736(20)31095-3. PMid:32386576.
12. Mian A, Khan S. Coronavirus: the spread of misinformation. BMC Med. 2020;18(1):18-9. http://dx.doi.org/10.1186/s12916-020-01556-3. PMid:32188445.
13. Silva LV, Harb MPAA, Santos AMTB, Teixeira CAM, Gomes VHM, Cardoso EHS et al. COVID-19 mortality underreporting in Brazil: analysis of data from government internet portals. J Med Internet Res. 2020;22(8):1-14. http://dx.doi.org/10.2196/21413. PMid:32730219.
14. Von-Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP et al. The strengthening the reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. PLoS Med. 2007;4(10):1623-7. http://dx.doi.org/10.1371/journal.pmed.0040296. PMid:17941714.
15. Eysenbach G. Improving the quality of web surveys: the checklist for reporting results of internet E-Surveys (CHERRIES). J Med Internet Res. 2004;6(3):1-6. http://dx.doi.org/10.2196/jmir.6.3.e34. PMid:15471760.
16. Ministério da Saúde (BR). Protocolo de manejo clínico da Covid-19 na Atenção Especializada. Brasília: Ministério da Saúde; 2020.
17. StataCorp. Stata statistical software: release 15. Texas: StataCorp; 2017.
18. Comar M, Brumat M, Concas MP, Argentini G, Bianco AR, Bicego L et al. COVID-19 experience: first italian survey on healthcare staff members from a mother-child research hospital using combined molecular and rapid immunoassay tests. SSRN Electron J. 2020:1-12. https://doi.org/10.2139/ssrn.3592658.
19. Flannery D, Gouma S, Dhudasia M, Mukhopadhyay S, Pfeifer M, Woodford E, et al. SARS-CoV-2 seroprevalence among parturient women. medRxiv. No prelo 2020. https://doi.org/10.1101/2020.07.08.20149179.
20. Garcia-Basteiro AL, Moncunill G, Tortajada M, Vidal M, Guinovart C, Jiménez A et al. Seroprevalence of antibodies against SARS-CoV-2 among health care workers in a large Spanish reference hospital. Nat Commun. 2020;11(1):3500. http://dx.doi.org/10.1038/s41467-020-17318-x. PMid:32641730.
21. Jerković I, Ljubić T, Bašić Ž, Kružić I, Kunac N, Bezić J et al. SARS-CoV-2 antibody seroprevalence in industry workers in Split-Dalmatia and Šibenik-Knin County, Croatia. J Occup Environ Med. 2021 jan 1;63(1):32-7. http://dx.doi.org/10.1097/jom.0000000000002020. PMid:32925526.
22. Stringhini S, Wisniak A, Piumatti G, Azman AS, Lauer SA, Baysson H et al. Seroprevalence of anti-SARS-CoV-2 IgG antibodies in Geneva, Switzerland (SEROCoV-POP): a population-based study. Lancet. 2020;396(10247):313-9. http://dx.doi.org/10.1016/S0140-6736(20)31304-0. PMid:32534626.
23. Amorim L Fo, Szwarcwald CL, Mateos SOG, Ponce de Leon ACM, Medronho RA, Veloso VG et al. Seroprevalence of anti-SARS-CoV-2 among blood donors in Rio de Janeiro, Brazil. Rev Saude Publica. 2020;54:69. http://dx.doi.org/10.11606/s1518-8787.2020054002643. PMid:32638883.
24. Gomes CC, Cerutti C, Zandonade E, Maciel ELN, de Alencar FEC, Almada GL et al. A population-based study of the prevalence of COVID-19 infection in Espirito Santo, Brazil: methodology and results of the first stage. MedRxiv. 2020. http://dx.doi.org/10.1101/2020.06.13.20130559.
25. Hallal PC, Hartwig FP, Horta BL, Silveira MF, Struchiner CJ, Vidaletti LP et al. SARS-CoV-2 antibody prevalence in Brazil: results from two successive nationwide serological household surveys. Lancet Glob Heal. 2020;8(11):E1390-8. https://doi.org/10.1016/S2214-109X(20)30387-9.
26. Pollán M, Pérez-Gómez B, Pastor-Barriuso R, Oteo J, Hernán MA, Pérez-Olmeda M et al. Prevalence of SARS-CoV-2 in Spain (ENE-COVID): a nationwide, population-based seroepidemiological study. Lancet. 2020;396(10250):535-44. http://dx.doi.org/10.1016/S0140-6736(20)31483-5. PMid:32645347.
27. Chu DK, Akl EA, Duda S, Solo K, Yaacoub S, Schünemann HJ et al. Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. Lancet. 2020;395(10242):1973-87. http://dx.doi.org/10.1016/S0140-6736(20)31142-9. PMid:32497510.
28. Wang C, Pan R, Tang S, Ji JS, Shi X. Mask use during COVID-19: a risk adjusted strategy. Environ Pollut. 2020 Nov;266(Pt 1):115099. http://dx.doi.org/10.1016/j.envpol.2020.115099.
29. Nguyen LH, Drew DA, Graham MS, Joshi AD, Guo CG, Ma W et al. Risk of COVID-19 among front-line health-care workers and the general community: a prospective cohort study. Lancet Public Health. 2020;5(9):e475-83. http://dx.doi.org/10.1016/S2468-2667(20)30164-X. PMid:32745512.
30. Bampoe S, Lucas DN, Neall G, Sceales P, Aggarwal R, Caulfield K et al. A cross-sectional study of immune seroconversion to SARS-CoV-2 in frontline maternity health professionals. Anaesthesia. 2020;75(12):1614-9. http://dx.doi.org/10.1111/anae.15229. PMid:32777861.
31. World Health Organization. Considerations for school-related public health measures in the context of COVID-19: annex to considerations in adjusting public health and social measures in the context of COVID-19. Geneva: WHO; 2020.
32. Rafael RMR, Neto M, Depret DG, Gil AC, Fonseca MHS, Souza-Santos R. Effect of income on the cumulative incidence of COVID-19: an ecological study. Rev Lat Am Enfermagem. 2020;28:e3344. http://dx.doi.org/10.1590/1518-8345.4475.3344. PMid:32609281.
33. Baqui P, Bica I, Marra V, Ercole A, van der Schaar M. Ethnic and regional variations in hospital mortality from COVID-19 in Brazil: a cross-sectional observational study. Lancet Glob Health. 2020;8(8):e1018-26. http://dx.doi.org/10.1016/S2214-109X(20)30285-0. PMid:32622400.
34. Wenham C, Smith J, Morgan R, Gender and COVID-19 Working Group. COVID-19: the gendered impacts of the outbreak. Lancet. 2020;395(10227):846-8. http://dx.doi.org/10.1016/S0140-6736(20)30526-2. PMid:32151325.
35. Chattu VK, Yaya S. Emerging infectious diseases and outbreaks: Implications for women's reproductive health and rights in resource-poor settings. Reprod Health. 2020;17(1):43. http://dx.doi.org/10.1186/s12978-020-0899-y. PMid:32238177.

36. Minayo MCS, Freire NP. Pandemia exacerba desigualdades na Saúde. Cien Saude Colet. 2020;25(9):3555-6. http://dx.doi.org/10.1590/1413-81232020259.13742020. PMid:32876280.

37. Li R, Pei S, Chen B, Song Y, Zhang T, Yang W et al. Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV-2). Science. 2020;368(6490):489-93. http://dx.doi.org/10.1126/science.abb3221. PMid:32179701.

38. Manners C, Larios Bautista E, Sidoti H, Lopez OJ. Protective adaptive immunity against severe acute respiratory syndrome Coronaviruses 2 (SARS-CoV-2) and implications for vaccines. Cureus. 2020;12(6):e8399. http://dx.doi.org/10.7759/cureus.8399. PMid:32499988.

39. Ni L, Ye F, Cheng ML, Feng Y, Deng YQ, Zhao H et al. Detection of SARS-CoV-2-specific humoral and cellular immunity in COVID-19 convalescent individuals. Immunity. 2020;52(6):971-977.e3. http://dx.doi.org/10.1016/j.immuni.2020.04.023. PMid:32413330.