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https://doi.org/10.22239/2317-269x.01983

Application of SARS-CoV-2 prevention and control measures among university students of a public institution in Ceará, Brazil

Aplicação das medidas de prevenção e controle do SARS-CoV-2 entre universitários de instituição pública do Ceará, Brasil

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Received: 02 Aug 2021
Approved: 07 Jul 2022

How to cite: Arrais PSD, Laurentino EM, Linard AG, Fonteles MMF, Sousa FJP, Almeida PC. Aplicação das medidas de prevenção e controle do SARSCoV-2 entre universitários de instituição pública do Ceará, Brasil. Vigil Sanit Debate, Rio de Janeiro, 10(3):1-9, agosto 2022. https://doi.org/10.22239/2317-269X.01983

ABSTRACT

Introduction: Universities are favorable environments for the spread of highly transmissible acute respiratory infections, such as COVID-19. Objective: To evaluate the application of COVID-19 prevention and control measures among students from a public university in the state of Ceará, Brazil. **Method:** This is a cross-sectional study developed with undergraduate students, regularly enrolled in semester 2020.1, in remote (non-face-to-face) activities. To calculate the sample, a population of 30,152 students was considered, a confidence of 95%, 3% sampling error and 50% expected frequency of use of protection and control measures against COVID-19 (n = 1,031). Of the 2,097 responses received, 360 were lost and 1,737 were analyzed. Data collection was carried out in December 2020, through an electronic questionnaire, available online, for this purpose. A descriptive analysis of the researched aspects was carried out. **Results:** Although 91.2% of students reported that they always wore a mask when leaving the house, only 1.4% complied with all the recommendations for its correct handling. 43.3% reported washing their hands according to the recommendations of the health authorities, but others' personal hygiene measures were insufficient; 65.4% reported that they used to go out to participate in activities that were not of extreme necessity; and 70.0% were public transport users. **Conclusions:** The evidence found predisposes university students to risks in the face of this pandemic.

KEYWORDS: COVID-19; University; Mask; Hand Hygiene; Physical Distancing

RESUMO

Introdução: Universidades são ambientes propícios à disseminação de infecções respiratórias agudas de elevada transmissibilidade, como a COVID-19. **Objetivo:** Avaliar a aplicação das medidas de prevenção e controle da COVID-19 entre estudantes de uma comunidade universitária do Ceará, Brasil. **Método:** Trata-se de estudo transversal desenvolvido junto aos estudantes da graduação de uma universidade pública do estado do Ceará, regularmente matriculados no semestre 2020.1, em atividades remotas (não presenciais). Para o cálculo da amostra, considerou-se uma população de 30.152 universitários, uma confiança de 95%, 3% de erro amostral e 50% de frequência esperada de uso das medidas de proteção e controle contra a COVID-19 (n = 1.031). Das 2.097 respostas recebidas, ocorreram 360 perdas e foram analisadas 1.737. A coleta de dados foi realizada em dezembro de 2020, por meio de questionário eletrônico, disponibilizado *online*, para esta finalidade. Realizou-se uma análise descritiva dos aspectos pesquisados. **Resultados:** Apesar de 91,2% dos universitários referirem que sempre usavam máscara ao sair de casa, somente 1,4% cumpriram com todas as recomendações para seu manuseio correto; 43,3% referiram lavar as mãos conforme as recomendações das autoridades sanitárias, mas outras medidas de higiene pessoal foram insuficientes; 65,4% referiram que costumavam sair para participar de atividades que não eram de extrema necessidade; e 70,0% eram usuários de transportes públicos. **Conclusões:** As evidências encontradas predispõem os universitários a riscos frente a COVID-19.

PALAVRAS-CHAVE: COVID-19; Universidade; Máscara; Higiene das Mãos; Distanciamento Físico

INTRODUCTION

For more than two years, the world has been in a Public Health Emergency of International Importance, with the spread of the new coronavirus, the SARS-CoV-2, which has been worrying government officials, managers and health professionals, the scientific community, and the society around the world Individuals may experience the following symptoms when contaminated: cough, sore throat or runny nose, anosmia, ageusia, diarrhea, abdominal pain, fever, chills, myalgia, fatigue and/or headache, and difficulty breathing[3]. Transmission can occur even without the appearance of signs and symptoms and may progress to severe acute respiratory syndrome.

In an attempt to contain its spread and spread, health authorities and researchers recommended the adoption of various protection and control measures against COVID-19[3,4,5,6,7]. Among the recommendations of the World Health Organization (WHO)[4,5], the following measures stand out: wearing a mask; wash hands every 2 hours or whenever necessary (for example: after sneezing); always cover your mouth and nose when coughing or sneezing, with your elbow or a disposable handkerchief; use disposable handkerchiefs for hygiene of secretions; avoid handling/touching the mucosa of the mouth, nose, and eyes; avoid shared use of personal objects (for example: glasses and bottles); avoid closed and crowded places; maintain a physical distance of at least one meter from other people; keep environments ventilated; and avoid close contact with people who show signs or symptoms of the disease.

Still regarding the use of the mask, people must adopt the recommendations related to the correct way of use, its removal, and its disposal so that these measures are effective. Likewise, people should follow hand washing recommendations[4,5,6]. In turn, social distancing was another measure adopted, with the aim of reducing interaction between people in a community and thus reducing the speed of transmission of the virus, given the existence of asymptomatic or oligosymptomatic people, who can transmit the disease[8].

In the timeline of the pandemic in Ceará, on March 16, 2020, through Decree No. 33,510, the state government declared a health emergency, at the state level, and established measures to combat and contain the disease. Among other measures, it determined the suspension of face-to-face educational activities in all schools, universities, and colleges, public education networks, as well as economic sectors[2].

On May 5, 2020, through Decrees nº 33.574 and nº 33.575, the government instituted more restrictive measures of social isolation in Fortaleza, capital of Ceará, including lockdown (8 to 31 May), minimum social distance of two meters, and mandatory mask use (statewide). Since then, successive decrees have been published, easing some of these measures or reintroducing more restrictive measures (https://www.ceara.gov.br/decretos-do-governo-do-ceara-com-acoes-contra-o-coronavirus/), with the return of face-to-face classes in higher education only taking place on June 26, 2021, through Decree No. 34,128, respecting the prevention and control measures against COVID-19.

Higher education institutions are environments conducive to the spread of highly transmissible acute respiratory infections, such as COVID-19, due to the large and frequent concentration of people in spaces that favor agglomeration, such as, for example: classrooms, laboratories, libraries, amphitheater, university restaurants, and motor vehicles, such as the *intercampi* buses, used to transport students. In this way, the Ministry of Education instituted the Biosafety Protocol for the return of activities in federal educational institutions, by Ordinance No. 572, from July 1st, 2020.

Studies on prevention and control measures against COVID-19 by university students are incipient. In a survey carried out at the University of Bristol, in England, with undergraduate and graduate students, who were in blended learning, a prevalence of 3% of students testing positive for COVID-19 was identified in the two weeks prior to the survey and that the number of contacts made by students inside and outside the institution may have contributed to their contamination[9].

In Brazil, in March 2021, there was a change in the profile of infected people, mainly affecting people under 60 years of age, including many healthy young people[10], which showed that the situation required precautions and care among young people.

The lack of knowledge about the health conditions of students is another worrying factor, because, in order to control risks to their health, it is necessary to have an overview of this situation from a situational diagnosis that provides predictive information on hygiene habits, health, and cultural aspects of this population group, potential host of contagious diseases.

From this perspective, it is opportune to know how the prevention and control measures against COVID-19 were being applied by the students, in order to identify the risks and intervention needs for greater protection of the university community in the return of their face-to-face activities.

According to the above, the present study aimed to evaluate the application of measures to prevent and control COVID-19 among students from a university community in Ceará.

METHOD

This is a cross-sectional study that used data from the research "*Avaliação das medidas de prevenção e controle do SARS-CoV-2 entre estudantes de comunidade universitária de instituições federais de ensino superior do Ceará e seus familiares*" (Evaluation of SARS-CoV-2 prevention and control measures among students from the university community of federal institutions of higher education in Ceará and their family members, in English).

The research was developed with undergraduate students of a Federal Higher Education Institution (IFES) in the state of Ceará, which occupies the 18th position among the best Brazilian universities, being the 2nd in the North and Northeast[11].

The study included students who were regularly enrolled in day and night courses in the 2020.1 semester (n = 235 courses), belonging to the three *campi* in the city of Fortaleza and four *campi* in the interior of the state, in the cities of Sobral, Quixadá, Crateús, and Russas.

For the calculation of the sample, the population of 30,152 students was considered, a confidence of 95%, 3% sampling error, and 50% expected frequency of use of protection and control measures against COVID-19. The calculated sample size was 1,031 students, stratified by academic unit.

Data collection was carried out in December/2020, through an electronic questionnaire, self-completed online, from the Elasa-Forms system (https://elasalearning.com.br/elasalearning/), containing information on: 1. sociodemographic aspects: gender; age; marital status; place of residence; monthly family income and aid received during the pandemic and basic sanitation; 2. the health conditions of the student and their families: if they have a chronic disease; if they belong to risk groups for COVID-19 (elderly, hypertensive, diabetic, asthmatic, chronic obstructive pulmonary disease, transplant recipients, immunosuppressed, people undergoing cancer treatment); if they developed signs and symptoms suggestive of COVID-19 from March to December 2020; if you performed COVID-19 tests and the reasons for not performing them; 3. access to health services.

Regarding the COVID-19 prevention and control measures, information was collected concerning: 1. wearing a mask when leaving the house; hand hygiene before and after putting on the mask; the handling of the mask; the time of wearing and changing the mask; and the place where the used mask was kept; 2. hand hygiene measures, in situations such as: blowing your nose, coughing, sneezing, before and after using the toilet, after contact with animals, before eating and preparing food, and all recommended rules for hand washing (rubbing all fingers, nails, the front and back of the hand, the thumb and its curve); type (soap, detergent, alcohol gel, or 70% liquid alcohol) and origin of hygiene products (donation, purchase, own manufacture, cannot afford to buy); and 3. social distancing: situations in which you usually leave the house, physical distance between people, and means of transport used.

The electronic questionnaire was tested among students from this and another IFES, in a total of ten people, with adjustments and adaptations being made to the online presentation and its layout.

To complete the questionnaire, an invitation letter was sent, via institutional e-mail, to all IFES students in the study. The letter contained the research link (covid.diamarcado.com.br) so that the student could access, read and agree to the Free and Informed Consent Term (ICF), only to then answer the research questionnaire, having the possibility to interrupt it at any time and continue filling it out at the most opportune moment.

Data were collected online and stored on the *Cloud Service Digital Ocean*, file in Excel (2020 version), and an exploratory descriptive analysis of the data was performed, with presentation of absolute and relative frequencies, as well as mean and minimum and maximum standard deviation for quantitative ones using SPSS statistical package (version 21).

The research was approved by the Research Ethics Committee of the Federal University of Ceará (CAAE: 34396520.9.0000.5054; opinion number: 4,159,777) and includes all ethical aspects of Resolution No. 466, of December 12, 2012, of the National Health Council.

RESULTS

Of the 2,097 university students who responded to the questionnaire, 360 were excluded because they stopped responding to the survey at some point and did not complete it, leaving 1,737 respondents. The sociodemographic characteristics and sanitary conditions in the participants' homes are presented in Table 1.

Most respondents were female (57.6%), were aged between 20 and 24 years (50.0%), were single (88.5%), residing in Fortaleza (67.6%), in houses with basic sanitation (79.0%) and with family income ≤ 2 minimum wages (50.0%) (Table 1).

During the period from March to December/2020, 351 university students (20.2%) received assistance from IFES, and 1,229 (70.7%) reported that a family member received assistance from the federal government, mainly through the emergency assistance program.

Regarding the health conditions of the participants, 17.2% said they had a chronic disease and that 69.5% of their families had people in the risk group for COVID-19, with an average of 2.0 ± 1.1 individuals.

Of the 1,732 university students who answered the questionnaire on the appearance of symptoms of COVID-19 between March and December 2020, the majority, 955 (55.1%), said yes. Of these, 397 (41.6%) were tested for COVID-19, with 13.2% testing positive; 372 did not undergo the test, because: did not find it necessary (n = 115; 31.0%), there was no indication (n = 77; 20.7%), did not find where to do it (n = 54; 14.5%), it was not available (n = 53; 14.2%) or had other justifications (n = 73; 19.6%); and 186 did not respond (19.4%). Overall, the prevalence of confirmed COVID-19 cases among college students was 7.4%.

In the six months prior to the survey, 64.4% of university students had some medical consultation, 22.2% sought emergency/urgency services, and 2.3% were hospitalized.

Regarding family members, of the 1,727 university students who answered this question, 952 (55.1%) stated that a family member had symptoms of COVID-19 in the six months prior to the survey.

Table 1. Characteristics of university students, according to sociodemographic aspects and sanitary conditions of the households. Ceará, December, 2020 (n = 1,737).

Variable/Category	Frequency (n)	%
Gender		
Female	1,001	57.6
Male	720	41.5
Non-binary	12	0.7
Did not answer	4	0.2
Age group		
15 - 19	381	22.0
20 - 24	866	50.0
25 - 29	228	13.0
30 - 34	117	6.7
35 or +	128	7.4
Did not answer	17	0.9
Marital status		
Single	1,537	88.5
Married	171	9.8
Separated	18	1.0
Widower	5	0.3
Did not answer	6	0.4
Place of residence (n = 1,731)		
Fortaleza	1,175	67.6
Metropolitan area	252	14.5
Sobral	75	4.3
Quixadá	24	1.4
Russas	16	0.9
Crateús	12	0.7
Other	177	10.2
Did not answer	6	0.4
Residence with access to basic sanitation (n = 1,726)		
Yes	1,371	79.0
No	355	20.4
Did not answer	11	0.6
Family income (MW*)		
< 1	231	13.3
1	195	11.2
> 1 and < 2	511	29.4
> 2 and < 3	254	14.6
> 3 and < 5	268	15.4
> 5 and < 10	154	9.0
> 10	106	6.1
Did not answer	18	1.0

Source: Elaborated by the authors, 2021.
MW: Minimum wage (BRL 1,045.00; base year: 2020).

Of these, 921 responded about the family member being tested for COVID-19, where 36.6% tested positive and only 173 (51.3%) were isolated at home. Overall (n = 1,727), the prevalence of COVID-19 cases among family members was 19.5%.

Of the 1,737 university students who responded to the study, 91.2% reported that they always wore a mask when leaving home (Table 2). In turn, with regard to its handling, 29.7% stated that they washed their hands before putting on the mask, and

Table 2. Characteristics of university students, according to use and handling of masks, hand hygiene, and social distancing. Ceará, December, 2020 (n = 1,737).

Variable/Category	Frequency (n)	%
Mask		
Wear a mask when leaving the house	1,584	91.2
Wash hands before putting on the mask	516	29.7
To put on the mask, hold it by the elastic	1,338	77.0
Often touches the fabric to adjust the mask	1,565	90.1
Usually change the mask every 2 hours	197	11.4
Usually keep the used mask in a bag	574	33.1
Wash hands after taking off the mask	1,019	58.8
Comply with all care rules for handling the mask	24	1.4
Hand hygiene		
Usually wash the hands:		
After blowing the nose	1,144	65.9
After coughing	513	29.5
After sneezing	662	38.1
Before using the restroom	339	19.5
After using the restroom	1,601	92.2
After contact with animals	859	49.5
Before eating or preparing food	1,522	87.6
Comply with all hand hygiene habits	114	6.6
When washing the hands, follows the rules taught in the health campaigns	752	43.4
Social distancing		
Degree of social distancing		
Only go out in cases of extreme need	383	22.0
Go out for activities that are not absolutely necessary	1,137	65.5
Spends a lot of time outside	216	12.5
When going outside, keep a physical distance of at least 2 m		
Yes	598	34.4
No	1,139	65.6

Source: Elaborated by the authors, 2021.

58.8%, after taking it off; 77.0% always put on the mask holding the elastic, without touching it; but 90.1% reported touching it while it was in use. Regarding the time of use, only 11.4% changed the mask every 2 h. Of the study participants, 33.1% used to keep the used mask in a bag. In general, only 1.4% of the participants fulfilled all the recommendations for the correct handling of the mask.

With regard to personal hygiene care (Table 2), it was found that 65.9% used to wash their hands after blowing their nose, after coughing (29.5%), and sneezing (38.1%). Before using the bathroom to perform their physiological needs, 19.5% used to wash their hands, while 92.2% did so after using the bathroom. Hand washing after contact with animals was performed by 49.5% and before eating or preparing food, by 87.6%. However, it was observed that only 6.6% of the participants adequately complied with all these rules of good personal hygiene.

Overall, 43.4% of university students always washed their hands according to the rules established by the WHO, regulatory agencies or made available in health campaigns transmitted through the media (Table 2). Most said they used to buy a mask (86.2%), 70% alcohol gel or liquid (86.2%), and soap/soap/detergent for hand cleaning (95.9%).

Regarding social distancing (Table 2), 65.4% reported that they spent most of their time at home but used to go out to participate in activities that were not of extreme necessity, followed by 12.5% who said they spend a great deal of time outside the home. Few people maintained a distance of at least 2 m between people (34.4%) and most university students stated that they used public transport, such as bus, taxi, motorcycle taxi or light rail transit (LRT) to travel to the university (70.2%).

DISCUSSION

The study took place at a time when IFES was in the process of remote teaching (not face-to-face). It made it possible to evaluate the application of COVID-19 prevention and control measures among university students and identified the prevalence of the disease among them and their families. It has merit for being among the first studies carried out, at the national level, differing from other works for not having privileged only university students in the health area[12] or specific categories in the health area, such as medicine[13], nursing[14], and dentistry[15].

Respondents to the electronic questionnaire were mostly female, young, single, living mainly in the city of Fortaleza, and with good access to basic sanitation. They generally represented the middle class. The greater female participation may be related to the fact that women are more committed to their well-being, their health and that of their families, and because they have a better perception of the situation, in relation to men[16,17,18].

Most university students resided in Fortaleza or in municipalities that make up the metropolitan region. The high population density, the concentration of economic activities and the confluence of human mobility in the region can predispose the population as a whole, and university students, to the risk of contracting COVID-19[18,19,20].

The situation experienced, from March to December 2020, with the implementation of social distancing measures to contain the spread of COVID-19, in the various Brazilian states and municipalities, generated a significant crisis, not only in health, but also economic and social[21], which also affected most of the families of students at the investigated IFES, leading them to seek government aid or, in the case of students, university aid (food), to ensure good living conditions[22,23].

As evidenced in the study by Aquino et al.[2], these policies of social protection and minimum income for formal workers are fundamental for the success of social distancing measures. However, these resources seem to have been insufficient and made available with delay[22].

The presence of students and family members belonging to the risk group for COVID-19 was observed in the research group. Consequently, this portion of study participants is eligible for priority vaccination, as they are individuals who mentioned some conditions and risk factors to be considered for possible complications of COVID-19, such as: arterial hypertension, diabetes, chronic obstructive pulmonary disease, cardiomyopathies of different etiologies, and malignant neoplasm[3,24].

Another aspect observed was the fact that a considerable portion of students who reported having signs and symptoms of COVID-19 did not undergo a test to confirm the disease. It is known that the diagnosis of COVID-19 is a challenge worldwide[25]. In Ceará, testing has been made available free of charge to the population through Testing Centers, set up in squares, or by scheduling a drive-thru service. However, in the first months of the epidemic, the demand was always greater than the supply of tests[26]. At the IFES of the study, the institution carried out free punctual testing of COVID-19 for undergraduate students, teaching and technical-administrative servers[27,28].

Although a portion of the university students did not perform the test, there was an accentuated search for medical and emergency consultations, reported by the students, in the six months prior to the research, which may explain the possible selection of cases for testing or not, based on medical recommendation, and possible hospital admissions.

From March to December 2020, the capital of Ceará, Fortaleza, had two peaks of confirmed cases: one between April and May, with a moving average always above 600 cases, followed by a reduction until July; and another in October, which lasted until the present moment (May 2021), with a moving average, in most cases, on the rise[29].

The prevalence of confirmed COVID-19 cases, found among university students and their families, is close to that found in studies by: Garces et al.[30], carried out in the first two months of the

beginning of the epidemic in Ceará (10.37%); de Hallal et al.[31], held in Fortaleza (about 15.00%); and Rafael et al.[32], carried out at the Brazilian School of Nursing (4.00%). In the international scenario, we identified the study carried out at the University of Bristol, in England, with undergraduate and graduate students, which identified a prevalence of 3%[9].

With regard to the aspects that may have contributed to the contamination of university students and their families, the following facts are found: first, most students reported that their family members resorted to social protection and minimum income policies for formal workers, and that they were probably subjected to long lines and crowds at banking institutions, or that students had family members working in the sectors considered essential[22]. Second, despite most university students stating that they used a mask when leaving the house, their handling was not considered to be the most appropriate, since many neglected to wash their hands before and after using it or were in the habit of touching it while wearing it. In addition, few were those who reported storing the used mask properly.

The concern is even greater when one notices the lack of care with personal hygiene, when coughing, sneezing, when going to the bathroom, before and after doing their physiological needs; also, before eating or handling food, and when having contact with animals. It was also evidenced that a considerable portion of the study participants did not follow the rules published for correct hand washing, which obeys an entire technique and specific step by step[3,33]. The findings do not differ from the study by Villela et al.[35], carried out in Brazil, in which the authors showed low adherence to protection measures, especially among the youngest (18 to 25 years), in the first two months of the presence of COVID-19 in the country.

Failure to comply with these measures can certainly favor contamination and the possibility of contracting the virus and other microorganisms[34]. A systematic review developed by Uribe et al.[36] showed that greater adherence to preventive measures and attitudes towards the disease are associated with greater health knowledge. Therefore, it is evident the need to reinforce the implementation of educational campaigns on the disease and rules of personal hygiene, respiratory etiquette, in the various situations mentioned, such as measures to control and prevent COVID-19, not only among students[12,13,14,15], but also involving the population as a whole, following the recommendations of national and international authorities[3,34].

Another aspect highlighted in the study was the fact that some students and family members with COVID-19 did not comply with home isolation, which may have favored the transmission of the disease between them. Limiting this contact is essential to interrupt the chain of transmission of COVID-19[34,37], combined with the continuous use of a mask[37, 38,,39].

Regarding social isolation, there are few university students who only leave home in situations of extreme need, most being in constant circulation in different environments, which increased the possibility of contamination. This finding does not differ from a study carried out among health students in the United States of America and Brazil[12] and from the national survey carried out by Datafolha, in December 2020, in which it was found that 54% of people reported leaving home to work or do other activities, taking the necessary care[40].

This situation seems a little better than that found by Costa de Assis et al.[19], who identified a low adherence to social isolation (49.7%) in the city of Fortaleza, in the period between February 26 and May 16, 2020.

It was also observed, in our study, that most university students reported that they usually use public transport to go to the university, especially the bus. With the social distancing measures implemented in the pandemic, companies had a drop in demand and absorbed extra costs to meet government measures, such as vehicle hygiene, purchase of protective equipment for workers, and avoid agglomerations in vehicles; consequently, they had a reduction in revenue, which generated losses for public transport companies[41].

In several capitals surveyed by Lima et al.[41], these factors caused the sale and reduction of the vehicle fleet, which can favor constant agglomerations at peak hours. It is important to emphasize that, if the situation of the reduction of the vehicle fleet remains, together with the non-observation of the protection and control measures against COVID-19, this could be the main mechanism of contamination of students, if they do not choose private or active (walking and cycling) transport. Consequently, the propagation in the university environment, in a situation of normalization, may be rapid.

In order to avoid this, in addition to the institutional protocols that contain the protection and control measures against COVID-19, the movement model, developed by Shaw et al.[42], demonstrates that reducing the number of people, the contact rate, and the length of stay on the *campus* are effective strategies to delay the spread of the pathogen. Testing among students would be another necessary process, which has already been carried out, at least on one occasion, by the home institution of the students participating in the present study[27].

Since the beginning of the COVID-19 epidemic in Ceará (March 2020), the IFES of origin of the participants in this research has followed the guidelines of the various state decrees that deal, among others, with the suspension of face-to-face classes in universities and other public and private educational establishments, and instituted the Committees to Combat the Coronavirus, at the central level and in the Centers and Faculties that make up the structure of the institution, responsible for the preparation of plans to combat COVID-19, which encompass the protection and care measures against COVID-19, recommended by international and national authorities, such as, for example, the Biosafety Protocol for the return of activities in federal educational institutions, established by the Ministry of Education,

through Ordinance No. 572/2020. This document reinforces the need to promote the dissemination of rules, guidelines for the placement, use, removal and correct disposal of masks, and measures to prevent contagion.

Likewise, when the opportunity to return to face-to-face activities was provided, IFES and its committees deliberated on the necessary care for this return, through, for example, Ordinance No. 158, of October 16, 2020, restricting this return to some activities, mainly with regard to practical classes and mandatory supervised internships, respecting general and specific biosafety protocols, including providing individual protection material for teachers and students, and recommending special attention to university students who had comorbidities and other risk situations related to COVID-19[43], added to the systematic monitoring of symptoms and screening of COVID-19 among students, especially those undergoing training in the health area, teachers, and administrative technicians[32].

The current situation still requires a lot of precautions and care[10]. Therefore, it is important that university students are aware of the severity and risks that this disease brings, and it is necessary to preserve or promote necessary changes to maintain or adapt to the protection and care measures against COVID-19, namely, wearing a mask, washing hands, distancing, and social isolation, until everyone can be vaccinated and with guaranteed immunity against this terrible disease. In turn, IFES must guarantee the necessary conditions for compliance with the health rules in the institution.

Our study did not assess the type of mask used by students, but a study by Pereira-Ávila et al.[44] pointed out that the "homemade" type made of fabric/cotton prevailed among the Brazilian population. According to the integrative review carried out by Silva et al.[45], this type of mask would only be effective if associated with other protective measures, such as "home isolation, good respiratory etiquette and regular hand hygiene", parameters that must be intensified by many of the students who participated in the research.

Some limitations of the study can be mentioned. The collection of information on some variables was based on self-report (reference to chronic diseases, clinical manifestations of COVID-19, and positive test result for COVID-19). The prevalence of positive cases for COVID-19 may be underestimated due to the fact that most of the people who reported signs and symptoms of flu syndrome had not been tested, which may reflect unequal access to diagnostic tests. The recall period used in the study (nine months) and the possibility of recall bias should also be considered. With regard to selection bias, it is believed to have been minimized, due to the wide distribution of SIM cards to low-income students by IFES, which allows the use of cell phones to respond to the instrument. It is not known for sure to what extent the information bias may have influenced the results regarding prevention and control measures, as these are measures required by health and government authorities, and overestimations may occur, for example, regarding wearing masks.

CONCLUSIONS

There is a lot of evidence found that predispose university students to risks in the face of this pandemic, due to the inadequate handling of masks, the lack of care with personal hygiene, the habit of using public transport for their trips to the university, and the failure to comply with social distancing measures. In light of this scenario, it is believed that the findings can provide subsidies for the strengthening of health education and biosafety attitudes, to minimize risks in the face of such tragedies.

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Author's Contributions

Arrais PSDA, Laurentino EM - Conception, planning (study design), analysis, data interpretation, and writing of the work. Linard AG, Fonteles MMF, Sousa FJP, Almeida PC – Conception and writing of the work. Almeida PC – Analysis, data interpretation, and writing of the work. All authors approved the final version of the work.

Conflict of Interests

The authors inform that there is no potential conflict of interest with peers and institutions, politicians, or financial in this study.