



Knowledge, attitudes and practices about COVID-19 of dental students in Ceará State, Brazil

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Abstract Prevention and control strategies for the COVID-19 pandemic include behavioral approaches and that identify potential intervention scenarios, such as the training process for health professionals. The aim of the present study was to analyze knowledge, attitudes and practices about COVID-19 and associated factors in dentistry students. This is a cross-sectional study with dentistry students from Higher Education Institutions in the state of Ceará, Brazil. 288 students regularly enrolled in Higher Education Institutions participated in the research. The sample showed a high frequency of adequacy of knowledge, attitudes and practices for the prevention of COVID-19. The relationship between the sociodemographic characteristics of the participants and their knowledge, attitudes and practices showed an association between the student's place of residence and distance from the nearest Basic Health Unit. Most students who live in both rural and urban areas have adequate practices regarding COVID-19, as well as most students who live near or far from the nearest Basic Health Unit also have knowledge, attitudes and practices appropriate. The low risk of infection observed in the studied sample, as well as the adequate level of knowledge, attitudes and practices considered adequate about COVID-19 do not exempt the need for continuous educational processes related to biosafety protocols.

Descriptors: COVID-19. Knowledge. Students, Dental.

Conocimientos, actitudes y prácticas sobre la COVID-19 de estudiantes de Odontología del Estado de Ceará, Brasil

Resumen Las estrategias de prevención y control de la pandemia de COVID-19 incluyen enfoques conductuales que identifican escenarios potenciales de intervención, como el proceso de formación de los profesionales de la salud. El objetivo del presente estudio fue analizar conocimientos, actitudes y prácticas sobre la COVID-19 y factores asociados en estudiantes de odontología. Se trata de un estudio transversal con estudiantes de odontología matriculados regularmente en instituciones de enseñanza superior del estado de Ceará. Participaron en la encuesta 288 estudiantes. Se observó una alta frecuencia de adecuación de conocimientos, actitudes y prácticas para la prevención de la COVID-19. La relación entre las características sociodemográficas de los participantes y los conocimientos, actitudes y prácticas mostró asociación con el lugar de residencia del estudiante y la distancia a la Unidad Básica de Salud (UBS) más cercana. La mayor parte de los estudiantes que viven tanto en zonas rurales como urbanas tienen prácticas adecuadas frente al COVID-19, así como la mayoría de los estudiantes que viven cerca o lejos de la UBS más cercana también tienen conocimientos, actitudes y prácticas adecuadas. El bajo riesgo de contagio observado en la muestra estudiada, así como el adecuado nivel de conocimientos, actitudes y prácticas consideradas adecuadas frente al COVID-19 no eximen la necesidad de procesos de educación continua relacionados con los protocolos de bioseguridad.

Descriptor: COVID-19. Conocimiento. Estudiantes de Odontología.

Conhecimentos, atitudes e práticas sobre COVID-19 de estudantes de Odontologia do Estado do Ceará, Brasil

Resumo Estratégias de prevenção e controle da pandemia de COVID-19 incluem abordagens comportamentais e que identifiquem cenários potenciais de intervenção, como o processo formativo de profissionais da saúde. O objetivo do presente estudo foi analisar conhecimentos, atitudes e práticas sobre COVID-19 e fatores associados



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em estudantes de Odontologia. Trata-se de um estudo transversal com os estudantes de Odontologia regularmente matriculados em instituições de ensino superior do estado do Ceará. Participaram da pesquisa 288 estudantes. Observou-se alta frequência de adequação de conhecimentos, atitudes e práticas para prevenção da COVID-19. A relação entre as características sociodemográficas dos participantes e os conhecimentos, atitudes e práticas mostrou associação com localidade de moradia do estudante e distância da Unidade Básica de Saúde (UBS) mais próxima. A maior parcela de estudantes que reside tanto em zona rural quanto em zona urbana apresenta práticas adequadas a respeito da COVID-19, assim como a maioria dos estudantes que moram circunvizinhos ou distantes da UBS mais próxima também apresentam conhecimentos, atitudes e práticas adequadas. O baixo risco de infecção observado na amostra estudada, assim como o adequado nível de conhecimentos, atitudes e práticas consideradas adequadas sobre a COVID-19 não isenta a necessidade de processos educativos contínuos relacionados aos protocolos de biossegurança.

Descritores: COVID-19. Conhecimento. Estudantes de Odontologia.

INTRODUCTION

Since its appearance in China in December 2019, the COVID-19 pandemic caused by the new coronavirus (SARS-CoV-2) has been one of the greatest health challenges on a global scale¹. COVID-19 is transmitted mainly through respiratory droplets from oral and nasal secretions, aerosols and nasal, oral and conjunctival mucosa of infected patients². The main signs and symptoms of the disease are similar to those of other respiratory viruses, including fever, cough-usually dry, tiredness and, in more severe cases, dyspnea, pulmonary bleeding and renal failure. The diagnostic method of choice is the genomic detection of the virus by Polymerase Chain Reaction via Reverse Transcriptase (RT-PCR) in material collected from the nasopharynx or oropharynx³.

The mortality rate of COVID-19 is estimated to be between 1 and 3% of symptomatic patients and increases considerably in adult patients over the age of 60 years, with preexisting comorbidities such as chronic pneumonitis, obesity, hypertension, diabetes, cancer and heart or kidney failure^{4,5}. At the time this research was carried out, Brazil had more than 19 million confirmed cases and more than 500 thousand deaths; and the Northeast region had 23.61% of the total number of cases in Brazil, with the state of Ceará having the second highest number of confirmed cases⁶.

As so far there is still no scientific evidence to guarantee the therapeutic efficacy of drugs to combat the pandemic, priority is given to non-pharmacological interventions, with the aim of postponing the peak of the epidemic curve, reducing the peak of demand for health care and reducing the number of cases and effects on the health of the population^{7,8}. In addition to vaccination, the most recommended attitudes to control the spread of COVID-19 are social distancing and frequent hand washing, as well as the use of PFF2 and N95 masks, which manage to retain contaminants present in the air, in the form of droplets and aerosols⁹.

Currently, four laboratories distribute vaccines against COVID-19 in Brazil. They are: Astrazeneca, which produces the vaccine developed by the University of Oxford, in partnership with Fiocruz; Butantan Institute, which in partnership with the Chinese laboratory Sinovac, produces the Coronavac vaccine; Pfizer, in partnership with German biotechnology company BioNTech; and Janssen, developed and produced by Janssen-Cilag Farmacêutica, part of the Johnson & Johnson group¹⁰.

In Brazil, the health response to the COVID-19 pandemic was centered on hospital services, with actions to increase the number of beds, especially intensive care units and respirators⁴. Notification, detection and follow-up of cases, with home isolation of cases and quarantine of contacts are activities carried out by the Primary Health Care (PHC) teams. The organization of different flows for the care of patients with mild conditions was also implemented, separating those with respiratory symptoms, identifying and guiding individuals at greater risk of developing severe conditions⁷.

In a pandemic context of high transmissibility, Brazil gained prominence as an emergency case in terms of morbidity and mortality due to COVID-19. This was a context that justified the purpose of this study in analyzing the adequacy of knowledge, attitudes and practices of Dentistry students in the State of Ceará in relation to prevention, transmission routes and the risk of infection of SARS-Cov-2, taking into account given that professional and training dental practice is associated with a high risk of infection, with aerosols and droplets produced in clinical-surgical procedures being the most important routes of transmission of COVID-19¹¹⁻¹³.

From this context, the aim of this study was to analyze knowledge, attitudes and practices about COVID-19 and associated factors among dental students in the State of Ceará in Brazil.

METHODS

This is a cross-sectional study carried out with dentistry students from higher education institutions (HEIs) in the state of Ceará. The subjects of the study were students over 18 years of age and of both sexes from the undergraduate course in Dentistry, regularly enrolled in public and private HEIs in the state of Ceará, constituting a population of 8,485 students according to e-MEC data for the year 2020¹⁴.

The sampling of study subjects was of the probabilistic type. The expected frequency for the event (knowledge, attitudes and practices) was 50%, with a sampling error of 5%, a confidence interval of 95% and a forecast of 30% of losses. The calculation for finite populations was performed using the sample statistical package *samplinbook* of the RStudio 1.4 program, which obtained the initial value of 368 units or participations to be registered in the research.

The initial recruitment for data collection was based on the availability of students from the Dentistry Courses at the Federal University of Ceará (UFC) at *Campi* Fortaleza and Sobral. Follow-up students from other courses was carried out using the snow ball sampling technique^{15,16}, or snowball, which allows participants to indicate another subject who might be interested in participating in the interview, identified to provide the researcher with an ever-increasing set of potential contacts, as well as the dissemination of the invitation to participate in the research through dissemination on social networks and/or messaging applications.

Data collection was performed using an instrument divided into two stages with remote application. Step 1 comprised questions of a sociodemographic nature, access to knowledge, attitudes and practices adapted for COVID-19¹⁷.

The triad knowledge, attitude and practice, in combination, produces social determination of life in human societies. For the present study, the following definitions were adopted: knowledge consists of remembering specific facts (within the educational system of which the individual is part) or the ability to apply specific facts to solve problems; attitude means having relatively constant opinions, feelings, predispositions and beliefs, directed towards a goal, person or situation; and the practice, considered as self-reported practice, is the decision-making to perform the action¹⁸.

Each of the three survey domains was categorized as adequate or inappropriate. Knowledge was considered inadequate when the subject answered 'I don't know' about COVID-19 being caused by a virus or its transmission being by air, its prevention mechanisms or about the risk of contamination through a person infected with COVID-19. Attitudes were considered inappropriate when the respondent reported not considering COVID-19 as a public health problem, not recognizing public health services as care strategies for patients with COVID-19, or not considering themselves to have enough information to act to prevent COVID-19. COVID-19. Practices were considered inadequate when the respondent reported not taking measures to avoid contamination, living in areas where COVID-19 prevention measures have not been implemented and/or not accepting the vaccine against COVID-19, if available.

For step 2, specificity/vulnerability scores for COVID-19 were calculated for the categories Symptoms, Contagion and Virulence and the sum obtained in the categories generated three risk ranges for COVID-19. These scores were based on epidemiological information from the Clinical Management Protocol for Coronavirus (COVID-19) in Primary Health Care¹⁹ with a categorization covering cases without risk, low risk, medium risk and high risk.

Data analysis applied descriptive and inferential statistics for the calculation. Data were categorized and frequency analyzes were performed. Subsequently, the association between the characteristics of the study subjects and the adequacy of responses, and between the variable knowledge, attitudes and practices and risk for COVID-19, was analyzed using Fisher's Exact Test. All analyzes were performed using the RStudio 1.4 program, considering $p < 0.05$ as statistically significant.

This research involved human beings and followed the recommendations of Resolution No. 466 of 2012 of the National Health Council. These results are part of the project entitled "Surveillance of risk factors for COVID-19 related to the global burden of disease in students of Dentistry courses in the state of Ceará", approved by the Research Ethics Committee of the Universidade Estadual Vale do Acaraú under number 4,009,393 (CAAE 55087322.8.0000.5569).

RESULTS

The losses corresponded to 21.8% of the expected sample. Thus, 288 students participated in the study, 212 women (73.61%) and 76 men (26.39%). The average age of participants was 21.88 years. Most students lived in the urban area ($n=246$, 85.42%) and 43.06% ($n=124$) lived between 2 and 5 km away from the nearest Basic Health Unit (UBS).

Students from 11 of the 16 Dentistry courses in Ceará participated in the study, with the highest frequencies being those enrolled at UFC Sobral Campus (UFC Sobral, $n=135$, 46.88%), Fortaleza University (UNIFOR, $n=48$, 16.67%) and INTA University Center (UNINTA, $n=46$, 15.47%). As for the family's monthly income, 39.58% ($n=114$) of the students reported more than 3 minimum wages and 30.90% ($n=90$) reported between 1 and 2 minimum wages. Sociodemographic data are detailed in Table 1.

It was found that a considerable portion of students gave answers considered adequate with regard to knowledge, attitudes and practices regarding COVID-19, although attitudes about COVID-19 had the highest general index of inadequacy compared to the other categories (Table 2).

The relationship between the participants' sociodemographic characteristics and knowledge, attitudes and practices showed, for the most part, no statistically significant association, except for the relationship between the following variables: location and practices; distance from UBS and knowledge; distance from UBS and attitudes; and distance from UBS and practices. The largest share of students who live in both rural and urban areas have a higher frequency of appropriate practices regarding COVID-19, as well as the majority of students who live nearby or are up to 5km from the nearest UBS also have knowledge, appropriate attitudes and practices. However, students from urban areas have practices with a higher level of adequacy compared to those from rural areas and the farther from a UBS, the more inadequate. The association analysis of sociodemographic variables with the survey result is shown in Table 3.

Table 4 shows an association between the risk of contamination by COVID-19 and sociodemographic variables. The risk is low and the association was statistically significant for all variables, except for income, which showed no association with the risk of contamination by the disease. The female sex was more related to a low or no risk, as well as the place of residence in the urban area and being aged between 18 and 25 years (Table 4).

DISCUSSION

The adequacy of knowledge, attitudes and practices in the sample studied can be justified by the existence of protocols for the prevention of COVID-19 disseminated to dentists and dentistry students similar to those existing for other communicable diseases, such as HIV/AIDS and Hepatitis: hand hygiene hands, use of personal protective equipment (gloves, masks, eyewear), respiratory hygiene/cough etiquette, sharps safety, safe injection practices (i.e., aseptic technique for parenteral medications), sterile instruments and devices, and clean environmental surfaces and disinfected^{20,21}. In the student context, due to the lack of experience of Dentistry students, infection control and patient care during the COVID-19 pandemic are a priority concern in academic management^{12,20,21}.

Table 1. Distribution of sociodemographic variables.

Variable	n	%
<i>Sex</i>		
Female	212	73.61
Male	76	26.39
<i>Area in which you reside</i>		
Rural	42	14.58
Urban	246	85.42
<i>Distance from the Basic Health Unit</i>		
Less than 1 km	116	40.28
Between 2 and 5 km	124	43.06
Between 6 and 10 km	28	9.72
Between 11 and 15 km	8	2.78
Do not know	12	4.17
<i>Monthly income</i>		
Less than 1 minimum wage	9	3.13
A minimum wage	42	14.58
Between 1 and 2 minimum wages	89	30.90
Above 3 minimum wages	114	39.58
Don't know/don't want to answer	34	11.81
<i>Age Range</i>		
Under 18 years old	4	1.39
18 to 21 years old	121	42.01
22 to 25 years	115	39.93
Greater than 25 years	48	16.67
<i>Educational institution</i>		
Unichristus	16	5.56
UFC	13	4.51
UFC Sobral	135	46.88
UNINTA	46	15.97
Faculdade Paulo Picanço	9	3.13
UNIFOR	48	16.67
UNIFANOR	3	1.04
UNICATOLICA Quixadá	10	3.47
UNINASSAU	6	2.08
Estácio	1	0.34
UNIFAMETRO	1	0.34

Table 2. Distribution of knowledge, attitudes and practices about COVID-19 and associated factors, in relation to the adequacy and inadequacy of Dentistry students in the State of Ceará.

Domains	Adequate		Inappropriate	
	n	%	n	%
Knowledge	277	96.2	11	3.8
Attitudes	242	84.0	46	16.0
Practices	280	97.2	8	2.8

Table 3. Association analysis of sociodemographic variables with the survey result.

Variables	Knowledge			Attitudes			Practices		
	+	-	p	+	-	p	+	-	p
<i>Sex</i>									
Male	206	6	0.16	175	37	0.27	206	6	0.8
Female	71	5		67	9		74	2	
<i>Area in which you reside</i>									
Rural	40	2	0.66	34	8	0.64	39	3	0.04
Urban	237	9		208	38		241	5	
<i>Distance from BHU</i>									
> 1 km	110	6	<0.01	99	17	<0.01	114	2	<0.01
2 to 5 km	120	4		104	20		120	4	
6 and 10 km	27	1		22	6		27	1	
11 and 15 km	8	0		7	1		7	1	
Do not know	12	0		10	2		12	0	
<i>Family income</i>									
> 1 minimum wage	9	0	0.98	6	3	0.158	9	0	0.20
1 minimum wage	41	1		34	8		41	1	
< 1 and > 3 minimum	86	3		80	9		89	0	
< 3 minimum wages	110	4		95	19		109	5	
Do not know	31	3		27	7		32	2	
<i>Age group</i>									
> 18 years old	4	0	0.87	4	0	0.92	4	0	0.81
18 to 21 years old	116	5		102	19		118	3	
22 to 25 years	110	5		97	18		112	3	
> 25 years	47	1		39	9		46	2	

+: Adequate; -: Inappropriate; BHU: Basic Health Unit.

Table 4. Risk of contamination by COVID-19 by Dentistry students in the State of Ceará.

Variables	High Risk	Medium Risk	Low Risk	Without Risk	p
<i>Sex</i>					
Male	0	26	160	26	<0.01
Female	1	8	58	9	
<i>Area in which you reside</i>					
Rural	0	4	36	2	<0.01
Urban	1	30	182	33	
<i>Distance from BHU</i>					
> 1 km	0	11	95	10	<0.01
2 to 5 km	0	18	86	20	
6 and 10 km	1	1	24	2	
11 and 15 km	0	2	4	2	
Do not know	0	2	9	1	
<i>Family income</i>					
> 1 minimum wage	0	0	7	2	0.57
1 minimum wage	0	3	36	3	
< 1 and > 3 minimum wages	1	8	69	11	
< 3 minimum wages	0	17	83	14	
Do not know	0	6	23	5	
<i>Age group</i>					
> 18 years old	0	0	2	2	<0.01
18 to 21 years old	1	8	100	12	
22 to 25 years	0	13	85	17	
> 25 years	0	13	31	4	

BHU: Basic Health Unit.

Unlike what was found in this research, a study evaluated Iranian dental students regarding infection control during the pandemic and concluded that knowledge about COVID-19 is not enough to protect themselves and patients who seek teaching clinics, emphasizing the need for training programs in plans to resume face-to-face activities, which could influence the drop in cross-infection numbers¹². In Pakistan, a study comparing the preventive behavior of medical students and doctors in the era of COVID-19 concluded that it improves with increasing levels of medical education and clinical exposure, with more preventive measures being adopted for their protection²¹, which is in line with the results obtained in the present study with Dentistry students from the State of Ceará. The higher frequency of inadequacy of attitudes towards knowledge and practices could be explained from the bioethical point of view of the pandemic in Brazil, with waves of scientific denialism linked to the slow and asymmetrical growth of research on COVID-19, which would contribute to greater uncertainty to face the disease in the country²².

The adequacy of knowledge, attitudes and practices about COVID-19 in Dentistry students in the State of Ceará is relevant, as students must develop the competence of clinical-epidemiological and community recognition of diseases to support decision-making in health, according to the current National Curriculum Guidelines²³. This was also the case in a study of Nigerian dental students regarding COVID-19 and infection control practices, which indicated good knowledge of preventive and screening strategies for COVID-19²⁴. Another study carried out with dentistry students in Saudi Arabia demonstrated a high frequency of knowledge, attitudes and appropriate practices with students at the institution, however with difficulties in distancing and social isolation. Therefore, despite the good level of knowledge, students at this institution tend to adopt only some of the attitudes and practices highlighted as relevant for coping with the pandemic²⁵.

It is important to understand that the student's place of residence deserves attention, especially because smaller locations or those located farther away from the host cities of the HEIs present difficulties in retaining health professionals, mainly physicians, in these territories, which compromises the longitudinality of care and preventing the spread of COVID-19²⁶. In addition, cases of COVID-19 that affect health professionals can make access to services even more difficult²⁷. Nurses, nursing technicians and community health agents are sometimes the only care providers in these locations. The scarcity of human resources in rural and remote areas makes access to this care difficult, requiring teams to coordinate care for the early removal of critically ill patients in the health care network^{28,29}.

The findings of the present study demonstrated that the female gender and the age group of 18 to 25 years were related to a low or no risk of contracting COVID-19. A study of laboratory parameters from two hospitals and a diagnostic company in Brazil showed that elderly male patients have significantly more abnormal laboratory values, including higher inflammatory markers, compared to elderly women³⁰. This may be related to sex hormones that mediate differently in innate immune cells and functional responses to Severe Acute Respiratory Syndrome (SARS), Influenza and other viruses in the respiratory tract^{31,32}.

Regarding age, a study of demographic and socioeconomic aspects of Brazilian adults and COVID-19 based on the analysis of risk groups showed that in the age group between 18 and 24 years, the prevalence of conditions associated with complications of COVID-19 reaches 12.2% of women and 15.7% of men. The prevalence increases with age, reaching 75% and 73.1% for men and women over 60 years old, respectively. This is mainly due to the presence of comorbidities that influence the severity of the disease, in the case of younger individuals, who generally do not have as many comorbidities, are at lower risk³³.

Students' income was not a variable with a significant association in the present study. This behavior could be explained in part by the profile of the legal nature of undergraduate courses in Dentistry in the country, where the number of private educational institutions exceeds four times the number of public ones and it would be expected, therefore, that this population would have a higher income³⁴.

The cross-sectional methodological design does not allow the elaboration of causal inferences, which is presented as a limitation of the study. However, sampling with an extension of subjects from across the State of Ceará allows the observed frequencies to provide a generalized overview of the phenomenon, with the possibility of identifying HEIs with

higher frequencies of inadequacy or self-reports related to risk for COVID-19. Thus, the results obtained provide subsidies for monitoring student care during a pandemic.

CONCLUSION

This study verified that dental students in the State of Ceará have knowledge, attitudes and practices considered adequate regarding COVID-19. The relationship between the participants' sociodemographic characteristics and knowledge, attitudes and practices showed an association with the student's place of residence and distance from the nearest UBS. The largest share of students who live in both rural and urban areas have adequate practices regarding COVID-19, as well as the majority of students who live close to or far from the nearest UBS also have adequate knowledge, attitudes and practices. The low risk of infection observed in the sample studied, as well as the adequate level of knowledge, attitudes and practices considered appropriate regarding COVID-19 do not exempt the need for continuous educational processes related to biosafety protocols.

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