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Covid-19 in the State of Ceará: behaviors and beliefs in the arrival of the pandemic

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Abstract *This study aimed to evaluate the behavioral aspects and beliefs of the population of Ceará in the face of the COVID-19 pandemic. An online questionnaire was conducted on sociodemographic aspects and opinions related to the pandemic. Absolute and relative frequencies were calculated, the association between variables was performed with Chi-square, and the level of significance was 5%. The final sample had 2,259 participants, and an association was observed between females and perceiving themselves with a high risk of infection ($p = 0.044$) and males with non-performance of voluntary quarantine ($p < 0.001$). People aged 80 years and over were partially quarantined due to the flow of people at home ($p < 0.001$). Participants with elementary school education had a lower risk of infection than participants with a higher level of education ($p < 0.001$). This group includes people who did voluntary quarantine the least ($p < 0.001$). Participants living in the inland region of the state had less direct contact with someone tested positive for the Coronavirus ($p = 0.031$) and are less reclusive ($p < 0.001$). We can conclude that the approach to the COVID-19 pandemic varies by social aspects, such as gender, age, education, and place of residence, as well as the belief system of the population of the State of Ceará.*

Key words *Pandemics, Coronavirus, Social behavior*

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Introduction

An outbreak of a new coronavirus disease (COVID-19, caused by Severe Acute Respiratory Syndrome Coronavirus 2-SARS-CoV-2) has been reported in Wuhan, China Since the end of December 2019, and has subsequently affected 26 countries worldwide[1,2]. In general, COVID-19 is an acute respiratory disease, with a 2% mortality rate[2]. The onset of the disease can result in death due to massive alveolar damage and progressive respiratory failure[1-3].

COVID-19 arrived in Latin America on February 25, 2020, when the Brazilian Ministry of Health confirmed the first case of the disease, a 61-year-old Brazilian man who traveled from February 9 to 20, 2020 to Lombardy, northern Italy, where a significant outbreak is occurring[4]. Until March 26, 2020, Brazil had 2,915 confirmed cases of COVID-19 and 77 deaths, according to official data from the Ministry of Health[5]. Meanwhile, the number of cases and deaths in the world hiked, reaching 526,006 infected people, with 23,720 deaths[6].

Through a state decree effective from March 20, 2020[7], the Government of the State of Ceará established more robust measures to contain the spread of COVID-19, which, at the time, totaled 20 notified cases, and was the State of the Northeast with the highest number of infected patients, ranking fourth among all Brazilian States[5]. On March 26, 2020, the Covid-19 positive cases rose to 235 people, with three deaths, and the State climb to the third spot in the country[5]. COVID-19's high dissemination rate has aroused the curiosity of the scientific community, given that one of the most critical factors in assessing the threat of an infectious disease epidemic is the pathogenic transmissibility[8].

Many factors can affect the speed with which effective disease control practices are implemented, such as information campaigns, local health practices, social behavior, and belief systems[9,10]. Person-to-person transmission occurs mainly by direct contact or by droplets spread by the cough or sneeze of an infected individual[11]. Thus, the fight against the spread of COVID-19 recommends washing hands frequently, avoiding hugs, kisses, and handshakes and adopting social distancing measures, such as quarantine[12].

Although Ceará is regularly affected by endemic diseases such as Dengue[13,14], Chikungunya[15], and Zika[16], as well as historical reports of epidemics[17], the characteristics of contagion and dissemination control measures are profoundly different from COVID-19[1]. Understanding how to delay and control the spread of pathogens is a priority in predicting and preventing epidemics of infectious diseases[8]. Thus, this study aimed to assess the behavioral aspects and beliefs of the population of Ceará in the face of the COVID-19 pandemic.

Methods

This cross-sectional study is a type of opinion survey with no identification of the participants, complying with the rules of Resolutions CNS/MS 466/12[18] and 510/16[19,20], and was carried out with residents in the State of Ceará, aged 18 or over, who could answer all questions through computers or smartphones. Partially answered questionnaires were excluded from the study.

An online questionnaire was conducted using Google® Forms and social media Instagram@, Facebook@, and WhatsApp@ were publicly used to disseminate the questionnaire. The instrument was available during the 24 hours preceding the governmental order to close all establishments that were not of public benefit and that the population remained quarantined in their homes. Thus, data were collected on March 19, 2020. The need for immediate observation of the population occurred due to possible changes in beliefs arising from the confinement period, as some individuals self-quarantined themselves.

Data collection

The questionnaire was built from closed-ended questions containing sociodemographic aspects and 12 questions dealing with beliefs about the pandemic. The following were investigated: gender (female, male, female transgender, male transgender), age group (18-19 years, 20-39 years; 40-59 years; 60-79 years; 80 years and over), place of residence (Metropolitan Region of Fortaleza-RMF, inland of the State of Ceará), marital status (married, separated/divorced, single, widowed), educational level (complete/incomplete elementary, complete/incomplete high school, complete/incomplete higher education, complete/incomplete postgraduate degree), area of activity (commerce, education, student, unemployed, management/legal/humanities, industry, health, technology, and other areas not mentioned).

The questions asked were as follows: P1- In your opinion, what is the level of your area of ac-

tivity concerning Coronavirus infection? (high, medium, low); P2- Are you in direct contact with someone who tested positive for coronavirus? (yes, no); P3- Are you quarantined? (No; Partially. Going out sometimes; Partially. Receiving people such as housekeepers, caregivers, and other; reclusive); P4- Concerning the quarantine, you follow the information you receive: (from official governmental bodies; from what I see in the media; from religious leaders; from close health professionals; from friends or relatives; P5- You believe that infection in Brazil: (will be lower than in the rest of the most affected countries, will be similar to the most affected countries, will be higher than in the rest of the most affected countries); P6- You believe that infection in Ceará: (will be lower than in the rest of Brazil, will be similar to the rest of Brazil, will be higher than in the rest of Brazil); P7- You believe that infection in Fortaleza: (will be lower than in other Brazilian capitals, will be similar to other Brazilian capitals, will be higher than in other Brazilian capitals); P8- Do you believe that we have some protection against the virus different from other places? (yes, no); P9- Do you believe that our hot climate will favor the reduction of the pandemic in the State of Ceará? (yes, no); P10- Do you believe that the constant viruses to which we submit will favor the reduction of the pandemic in the State of Ceará? (yes, no); P11- Do you believe that the constant viruses to which we submit will favor a weaker action by the Coronavirus? (yes, no); P12- Do you believe that our most impoverished living in poor sanitary conditions will favor their contamination at what level? (higher than in the high-income population, lower than in the high-income population, all will be equally infected).

Statistical analysis

The data were tabulated in an Excel spreadsheet and analyzed using SPSS software version 24.0®. Absolute and relative frequencies were calculated for all study variables. The association between variables was verified using the Chi-square test. A significance level of 5% was adopted for inferential procedures.

Results

A total of 2,364 people answered the questionnaire. However, following the exclusion of the incomplete questionnaires, the final sample had 2,259 participants. Of these, most were female (68.1%). The single (49%), aged 20-39 years (61.6%), with complete or incomplete higher education (47.3%), working in the health field (29.5%) and residing in the Metropolitan Region of Fortaleza (80.4%) were prevalent.

Regarding the questions asked to the whole group, 61.4% considered that the risk of infection by the coronavirus in their area of operation was high; 98.1% had no direct contact with someone who tested positive for the coronavirus; 52.5% were in partial quarantine, sometimes leaving home; and 65.8% followed information from official government agencies.

Regarding infection with the coronavirus in Brazil, 43.4% believed that it would be similar to the most affected countries in the world. Likewise, they considered as similar the infection of Ceará when compared to other Brazilian states (53.6%) and Fortaleza when compared to other Brazilian capitals (59.9%).

A total of 79.2% of respondents do not believe that we have any protection from the virus, unlike elsewhere. Concerning the local warm climate favoring the reduction of the pandemic, 57.3% do not believe in this protection, nor do they accept the assumption that the constant viruses to which we are submitted will favor the reduction of the pandemic in the State (84.5%), or that such viruses favor a weaker action of the coronavirus (82.4%). As for the most impoverished population living with poor sanitary conditions, 60.5% stated the belief that their infection will be higher than the high-income population.

When the questions asked had their answers compared between males and females, an association was observed between females and perceiving themselves at high risk of infection ($p = 0.044$) and males with the non-performance of voluntary quarantine ($p < 0.001$). When compared to men, women do not believe that: we have some protection from the virus different from other places ($p = 0.013$); our hot climate will favor the decrease of the pandemic in the State of Ceará ($p < 0.001$), the constant viruses to which we submit will favor the decrease of the pandemic in the State of Ceará ($p = 0.014$), and also do not believe that the constant viruses to which we are exposed will favor a weaker action of the coronavirus ($p < 0.001$) (Table 1).

Concerning the answers and their relationship with the age groups proposed in the study, we observed that people aged 80 and over consider that what they do has a medium risk of infection with COVID-19, while the group aged

Table 1. Association between the responses to the questionnaire and the participants' gender.

Variables	Female		Male		P-value
	n	%	n	%	
P1- In your opinion, what is the level of your area of activity concerning Coronavirus infection?					0.044
High	961	62.4	426	59.2	
Medium	384	24.9	214	29.8	
Low	195	12.7	79	11.0	
P2- Are you in direct contact with someone who tested positive for coronavirus?					0.103
Yes	25	1.6	19	2.6	
No	1515	98.4	700	97.4	
P3- Are you quarantined?					< 0.001
No	137	8.9	108	15.0	
Partially. Going out sometimes	784	50.9	403	56.1	
Partially. Receiving people	243	15.8	83	11.5	
Totally reclusive	376	24.4	125	17.4	
P4- Concerning the quarantine, you follow the information you receive:					0.659
From the Government	1016	66.0	471	65.5	
From the social media	310	20.1	155	21.6	
From friends and relatives	35	2.3	12	1.7	
From health professionals	176	11.4	78	10.8	
From religious leaders	3	0.2	3	0.4	
P5- You believe that infection in Brazil is:					0.055
Higher	357	23.2	165	22.9	
Similar	645	41.9	336	46.7	
Lower	538	34.9	218	30.3	
P6- You believe that infection in Ceará is:					0.405
Higher	94	6.1	35	4.9	
Similar	829	53.8	382	53.1	
Lower	617	40.1	302	42.0	
P7- You believe that infection in Fortaleza is:					0.309
Higher	92	6.0	25	3.5	
Similar	920	59.7	433	60.2	
Lower	528	34.3	261	36.3	
P8- Do you believe that we have some protection against the virus different from other places?					0.013
Yes	298	19.4	172	23.9	
No	1242	80.6	547	76.1	
P9- Do you believe that our hot climate will favor the reduction of the pandemic in the State of Ceará?					< 0.001
Yes	620	40.3	344	47.8	
No	920	59.7	375	52.2	
P10- Do you believe that the constant viruses to which we submit will favor the reduction of the pandemic in the State of Ceará?					0.014
Yes	219	14.2	131	18.2	
No	1321	85.8	588	81.8	
P11- Do you believe that the constant viruses to which we submit will favor a weaker action by the Coronavirus?					< 0.001
Yes	239	15.5	158	22.0	
No	1301	84.5	561	78.0	
P12- Do you believe that our most impoverished living in poor sanitary conditions will favor their contamination at what level?					0.571
Higher	943	61.2	424	59.0	
Similar	498	32.3	244	33.9	
Lower	99	6.4	51	7.1	

Chi-square test.

20-39 years considers it high ($p < 0.001$). This same group with 80 years and over is the one performing quarantine partially because of the flow of people at home ($p < 0.001$), and whose information is less concentrated as in all other groups, as they listen a lot to the health professionals with which they have bonds ($p = 0.008$). These people believe that the pandemic level will be lower in Brazil than in the rest of the most affected countries ($p < 0.001$), that we are protected against the virus differently from other places ($p = 0.002$), that the climate of Ceará will favor the decrease of the pandemic in the State ($p < 0.001$), and that poor sanitary conditions will lead the most impoverished population to a higher level of infection than in the high-income population ($p = 0.042$) (Table 2).

In the association between the responses to the questionnaire and the level of education, participants with primary education considered that they are at a lower level of risk than participants with a higher level of education ($p < 0.001$). In this group are people who did voluntary quarantine the least ($p < 0.001$) and receive information mainly from social media ($p < 0.001$). Individuals with primary education also believe that the level of infection in Brazil will be lower than in the rest of the countries most affected ($p < 0.001$), that it will be lower in Ceará than in other states ($p < 0.001$), and that it will be lower in Fortaleza than in other capitals ($p < 0.001$). Those with postgraduate degrees consider that they have no protection against the virus, unlike other places ($p < 0.001$), our climate will not favor the reduction of the pandemic in the State ($p < 0.001$), the constant viruses that affect us will not favor the decreased pandemic in Ceará ($p < 0.001$), and will not even favor a weaker action of the coronavirus ($p < 0.001$). People with elementary education also believe that the health situation of most of the most impoverished populations will entail a lower level of infection by COVID-19 than in the high-income population (Table 3).

Given the association between the responses of the participants with the place of residence, those who live in the inland region of State had less direct contact with someone testing positively for coronavirus ($p = 0.031$), are less totally reclusive ($p < 0.001$) and seek social media more to receive information ($p = 0.009$). They also believe that the infection level will be lower in Ceará than in the rest of the country ($p < 0.001$), that our climate is a decisive factor against the increase in cases ($p = 0.049$), and that the constant viruses that occur in the State will favor the decrease of the pandemic ($p = 0.033$) when compared to those living in the Metropolitan Region of Fortaleza (RMF).

Discussion

Started in the city of Wuhan, in the province of Hubei, located in southeastern China, COVID-19 first patients were diagnosed in November 2019 and spread quickly to the rest of the country[21]. Soon, countries close to and receiving large numbers of travelers from China, such as Japan and South Korea, showed their first cases. However, the highest spread occurred from east to west, reaching Asian countries and, later, European countries[22].

The oceanic separation from the American continent further delayed infection, although the United States soon began to notify the presence of COVID-19 given the number of travelers they receive, which was the primary form of infection[23]. Infection also occurred in Brazil, and the city of São Paulo recorded the first case in Latin America[4]. As the pandemic spread, it became evident that the necessary containment measures were delayed. In 2009, the influenza A (H1N1) pandemic had already shown the existence of several gaps in the global response capacity to public health emergencies[24]. In the State of Ceará, the capital of which receives the most tourists in Brazil, including many foreigners, the wait for government measures to mitigate COVID-19 infection occurred amid behaviors and beliefs.

Community behavior is one of the crucial factors to avoid a higher number of cases and deaths from viral infections[8,25]. South Korea and Japan had already shown a flat curve of disease progression through restrictive measures[26,27]. On the other hand, Iran and Italy delayed taking these measures or had difficulty in controlling the people's obedience, and started to count many sick or dead people[26,27]. However, behavioral change depends on the context and is difficult to predict due to social characteristics, socioeconomic, and behavioral differences among people[8,28]. Unlike European and Asian countries, Brazil has little experience with catastrophes and calamities, with no local culture for preventing these situations. was a body responsible for civil protection created and acting in emergencies and public calamity, the Civil Defense was only in WW2, and has been active in specific situations since then[29].

The primary responsibility of the community in containing the progression of the pandemic

Table 2. Association between the responses to the questionnaire and the age range of the participants.

Variables	18-19 years		20-39 years		40-59 years		60-79 years		80 years and over		P-value
	n	%	n	%	n	%	n	%	n	%	
P1- In your opinion, what is the level of your area of activity concerning Coronavirus infection?											< 0.001
High	53	59.6	933	67.0	320	54.4	80	44.0	1	12.5	
Medium	21	23.6	322	23.1	189	32.1	59	32.4	7	87.5	
Low	15	16.9	137	9.8	79	13.4	43	23.6	0	0.0	
P2- Are you in direct contact with someone who tested positive for coronavirus?											0.861
Yes	1	1.1	28	2.0	10	1.7	5	2.7	0	0.0	
No	88	98.9	1364	98.0	578	98.3	177	97.3	8	100	
P3- Are you quarantined?											< 0.001
No	4	4.5	142	10.2	78	13.3	21	11.5	0	0.0	
Partially. Going out sometimes	45	50.6	772	55.5	317	53.9	51	28.0	2	25.0	
Partially. Receiving people	13	14.6	175	12.6	89	15.1	44	24.2	5	62.5	
Totally reclusive	27	30.3	303	21.8	104	17.7	66	36.3	1	12.5	
P4- Concerning the quarantine, you follow the information you receive:											0.008
From the Government	57	64.0	911	65.4	403	68.5	113	62.1	3	37.5	
From the social media	26	29.2	303	21.8	101	17.2	33	18.1	2	25.0	
From friends and relatives	2	2.2	22	1.6	13	2.2	9	4.9	1	12.5	
From health professionals	4	4.5	154	11.1	68	11.6	26	14.3	2	25.0	
From religious leaders	0	0.0	2	0.1	3	0.5	1	0.5	0	0.0	
P5- You believe that infection in Brazil is:											< 0.001
Higher	15	16.9	336	24.1	143	24.3	28	15.4	0	0.0	
Similar	49	55.1	637	45.8	223	37.9	70	38.5	2	25.0	
Lower	25	28.1	419	30.1	222	37.8	84	46.2	6	75.0	
P6- You believe that infection in Ceará is:											0.195
Higher	4	4.5	68	4.9	48	8.2	9	4.9	0	0.0	
Similar	48	53.9	749	53.8	308	52.4	103	56.6	3	37.5	
Lower	37	41.6	575	41.3	232	39.5	70	38.5	5	62.5	
P7- You believe that infection in Fortaleza is:											0.189
Higher	2	2.2	60	4.3	44	7.5	11	6.0	0	0.0	
Similar	53	59.6	848	60.9	340	57.8	107	58.8	5	62.5	
Lower	34	38.2	484	34.8	204	34.7	64	35.2	3	37.5	
P8- Do you believe that we have some protection against the virus different from other places?											0.002
Yes	16	18.0	274	19.7	123	20.9	52	28.6	5	62.5	
No	73	82.0	1118	80.3	465	79.1	130	71.4	3	37.5	
P9- Do you believe that our hot climate will favor the reduction of the pandemic in the State of Ceará?											< 0.001
Yes	40	44.9	541	38.9	268	45.6	107	58.8	8	100	
No	49	55.1	851	61.1	320	54.4	75	41.2	0	0.0	
P10- Do you believe that the constant viruses to which we submit will favor the reduction of the pandemic in the State of Ceará?											0.293
Yes	14	15.7	201	14.4	97	16.5	37	20.3	1	12.5	
No	75	84.3	1191	85.6	491	83.5	145	79.7	7	87.5	

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Table 2. Association between the responses to the questionnaire and the age range of the participants.

Variables	18-19 years		20-39 years		40-59 years		60-79 years		80 years and over		P-value
	n	%	n	%	n	%	n	%	n	%	
P11- Do you believe that the constant viruses to which we submit will favor a weaker action by the Coronavirus?											0.516
Yes	19	21.3	233	16.7	105	17.9	38	20.9	2	25.0	
No	70	78.7	1159	83.3	483	82.1	144	79.1	6	75.0	
P12- Do you believe that our most impoverished living in poor sanitary conditions will favor their contamination at what level?											0.042
Higher	61	68.5	854	61.4	345	58.7	101	55.5	6	75.0	
Similar	24	27.0	432	31.0	210	35.7	74	40.7	2	25.0	
Lower	4	4.5	106	7.6	33	5.6	7	3.8	0	0.0	

Chi-square test.

Table 3. Association between the responses to the questionnaire and the level of education of the participants.

Variables	Elementary		Secondary		Higher Education		Postgraduation		P-value
	n	%	n	%	n	%	n	%	
P1- In your opinion, what is the level of your area of activity concerning Coronavirus infection?									< 0.001
High	4	18.2	97	41.3	634	59.3	652	69.9	
Medium	11	50.0	79	33.6	302	28.3	206	22.1	
Low	7	31.8	59	25.1	133	12.4	75	8.0	
P2- Are you in direct contact with someone who tested positive for coronavirus?									0.419
Yes	1	4.5	2	0.9	24	2.2	17	1.8	
No	21	95.5	233	99.1	1045	97.8	916	98.2	
P3- Are you quarantined?									< 0.001
No	1	4.5	55	23.4	102	9.5	87	9.3	
Partially. Going out sometimes	17	77.3	122	51.9	573	53.6	475	50.9	
Partially. Receiving people	2	9.1	21	8.9	144	13.5	159	17.0	
Totally reclusive	2	9.1	37	15.7	250	23.4	212	22.7	
P4- Concerning the quarantine, you follow the information you receive:									< 0.001
From the Government	12	54.5	139	59.1	663	62.0	673	72.1	
From the social media	7	31.8	66	28.1	272	25.4	120	12.9	
From friends and relatives	1	4.5	10	4.3	27	2.5	9	1.0	
From health professionals	2	9.1	18	7.7	105	9.8	129	13.8	
From religious leaders	0	0.0	2	0.9	2	0.2	2	0.2	
P5- You believe that infection in Brazil is:									< 0.001
Higher	2	9.1	29	12.3	233	21.8	258	27.7	
Similar	6	27.3	70	29.8	484	45.3	421	45.1	
Lower	14	63.6	136	57.9	352	32.9	254	27.2	
P6- You believe that infection in Ceará is:									< 0.001
Higher	1	4.5	10	4.3	55	5.1	63	6.8	
Similar	5	22.7	91	38.7	579	54.2	536	57.4	
Lower	16	72.7	134	57.0	435	40.7	334	35.8	

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Table 3. Association between the responses to the questionnaire and the level of education of the participants.

Variables	Elementary		Secondary		Higher Education		Postgraduation		P-value
	n	%	n	%	n	%	n	%	
P7- You believe that infection in Fortaleza is:									< 0.001
Higher	2	9.1	7	3.0	51	4.8	57	6.1	
Similar	7	31.8	104	44.3	645	60.3	597	64.0	
Lower	13	59.1	124	52.8	373	34.9	279	29.9	
P8- Do you believe that we have some protection against the virus different from other places?									< 0.001
Yes	6	27.3	65	27.7	243	22.7	156	16.7	
No	16	72.7	170	72.3	826	77.3	777	83.3	
P9- Do you believe that our hot climate will favor the reduction of the pandemic in the State of Ceará?									< 0.001
Yes	16	72.7	141	60.0	473	44.2	334	35.8	
No	6	27.3	94	40.0	596	55.8	599	64.2	
P10- Do you believe that the constant viruses to which we submit will favor the reduction of the pandemic in the State of Ceará?									< 0.001
Yes	5	22.7	62	26.4	179	16.7	104	11.1	
No	17	77.3	173	73.6	890	83.3	829	88.9	
P11- Do you believe that the constant viruses to which we submit will favor a weaker action by the Coronavirus?									< 0.001
Yes	8	36.4	72	30.6	208	19.5	109	11.7	
No	14	63.6	163	69.4	861	80.5	824	88.3	
P12- Do you believe that our most impoverished living in poor sanitary conditions will favor their contamination at what level?									< 0.001
Higher	8	36.4	118	50.2	650	60.8	591	63.3	
Similar	10	45.5	93	39.6	339	31.7	300	32.2	
Lower	4	18.2	24	10.2	80	7.5	42	4.5	

Chi-square test.

was in the fact that many Health Systems could collapse, as they did in some countries. A study with 182 countries found that 33% had low capacity to respond to a public health event, and 24% had little available functional capacity, even with the support of funds coming from elsewhere. These events include infectious diseases[30].

In this study, females believed to have a high risk of infection by coronavirus (Table 1), which is explained due to the greater sense of self-care among women[31]. Moreover, the higher perception of greater risk of COVID-19 infection by women is perhaps because the study included many health professionals who are at higher risk since the health sector's workforce is predominantly female. However, infection by COVID-19 seems to have a gender preference[32,33]. Chen et al. found a higher number of men infected by COVID-19 than women. In previous SARS and MERS epidemics, men were also more likely to be infected than women[32]. This may have to do with the vital role of women's X chromosomes and sex hormones in the body's immune system[34]. While more susceptible to coronavirus infection, male participants were more negligent and did not voluntarily quarantine (Table 1). In social imagery, men see themselves as invulnerable beings, which contributes to them taking less care and exposing themselves more to risky situations[31].

Pandemics have already caused severe damage throughout history. At least ten significant pandemics have occurred in the last three centuries, which have had a significant impact on morbimortality in a few weeks, affecting main-

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ly children and young adults and causing social disruption situations. The city of Fortaleza had a thousand deaths in a single day in a smallpox epidemic that occurred in 1868[17,35]. People of all ages can be infected with coronavirus[33]. In this study, the group aged 20-39 years considered having a high risk of infection (Table 2). Approximately 72% of confirmed cases of COVID-19 infection are 40 years of age or older[33]. Additionally, older adults are considered a factor of concern for contamination with COVID-19, since increasing age is associated with death[36]. For study participants aged 80 or over, their belief system favors negligent behavior, as they believe that they have a medium risk of infection, the pandemic level will be lower in Brazil, and that we have greater protection for COVID-19 (Table 2). This group also reported that their quarantine is partially performed because of the flow of people at home, which can be explained due to the generational bond of Brazilian families, where older adults are protected[37], besides the figure of the caregiver present mainly in the last decade[38]. Therefore, data point to a higher vulnerability of elderly participants in the State of Ceará to infection by COVID-19 due to social and behavioral aspects. The main limitation of this study is that it was carried out in a convenience sample, which restricts the external generalization of the findings.

The level of education can be considered a risk factor for the spread of infectious viral diseases and developing to death[25,39]. In this paper, participants with elementary education considered that they were at a lower level of risk than participants with a higher level of education and adopted voluntary quarantine less (Table 3). However, what is observed in the research is that the level of education and the severity of the disease may be associated with the individual's social class, suggesting that habits, living conditions, and knowledge about the disease influence the prognosis[25,39]. Thus, individuals with lower schooling would be more likely to contract the infection, as they use public transport, live and visit places with a higher number of individuals, and have limited access to medical resources. Among other factors, they would have fewer resources to adopt preventive measures, such as the use of gel alcohol for hand hygiene, and therapeutic measures, such as the use of palliative drugs, predisposing these individuals to death from infection[39].

The coronavirus arrived in Brazil through people who had traveled abroad, and it started in the big capitals. So when the questionnaire was applied, we expected that those living in the RMF were more likely to have direct contact with someone tested positive for coronavirus compared to those living in the inland region ($p = 0.031$). This also makes them less reclusive ($p < 0.001$). Even with a high level of education (85.1% with higher education and postgraduate degrees), people living outside large centers tend to be closer. According to Vargas[40], a prevailing inland life outside of large urban centers provides a more significant network of social support, helping to survive, supplying the very absence of the State in its many needs. Such a situation creates bonds, and distance and isolation can become harder. Probably, these links and closest social connections in inland cities strengthen certain beliefs present in Table 4.

Conclusion

We can conclude that the approach of the COVID-19 pandemic in the State of Ceará generated significant differences of beliefs when comparing gender, age, education, and place of residence. The system of local beliefs and behaviors showed that men, less educated people, older adults over 80 years, and those living in inland cities of the State are more vulnerable to infection by the coronavirus.

Table 4. Association between the responses to the questionnaire and the participants' place of residence.

Variables	RMF		State inland		P-value
	n	%	n	%	
P1- In your opinion, what is the level of your area of activity concerning Coronavirus infection?					0.121
High	1109	61.0	278	62.9	
Medium	496	27.3	102	23.1	
Low	212	11.7	62	14.0	
P2- Are you in direct contact with someone who tested positive for coronavirus?					0.031
Yes	41	2.3	3	0.7	
No	1776	97.7	439	99.3	
P3- Are you quarantined?					< 0.001
No	181	10.0	64	14.5	
Partially. Going out sometimes	918	50.5	269	60.9	
Partially. Receiving people	274	15.1	52	11.8	
Totally reclusive	444	24.4	57	12.9	
P4- Concerning the quarantine, you follow the information you receive:					0.009
From the Government	1206	66.4	281	63.6	
From the social media	353	19.4	112	25.3	
From friends and relatives	39	2.1	8	1.8	
From health professionals	216	11.9	38	8.6	
From religious leaders	3	0.2	3	0.7	
P5- You believe that infection in Brazil is:					0.157
Higher	425	23.4	97	21.9	
Similar	801	44.1	180	40.7	
Lower	591	32.5	165	37.3	
P6- You believe that infection in Ceará is:					< 0.001
Higher	115	6.3	14	3.2	
Similar	1009	55.5	202	45.7	
Lower	693	38.1	226	51.1	
P7- You believe that infection in Fortaleza is:					0.180
Higher	98	5.4	19	4.3	
Similar	1100	60.5	253	57.2	
Lower	619	34.1	170	38.5	
P8- Do you believe that we have some protection against the virus different from other places?					0.190
Yes	368	20.3	102	23.1	
No	1449	79.7	340	76.9	
P9- Do you believe that our hot climate will favor the reduction of the pandemic in the State of Ceará?					0.049
Yes	757	41.7	207	46.8	
No	1060	58.3	235	53.2	
P10- Do you believe that the constant viruses to which we submit will favor the reduction of the pandemic in the State of Ceará?					0.033
Yes	267	14.7	83	18.8	
No	1550	85.3	359	81.2	
P11- Do you believe that the constant viruses to which we submit will favor a weaker action by the Coronavirus?					0.547
Yes	315	17.3	82	18.6	
No	1502	82.7	360	81.4	

it continues

Table 4. Association between the responses to the questionnaire and the participants' place of residence.

Variables	RMF		State inland		P-value
	n	%	n	%	
P12- Do you believe that our most impoverished living in poor sanitary conditions will favor their contamination at what level?					0.795
Higher	1098	60.4	269	60.9	
Similar	601	33.1	141	31.9	
Lower	118	6.5	32	7.2	

Chi-square test.

RMF: Metropolitan Region of Fortaleza.

Collaborations

DLF Lima and JR Neri: idealization of the study, experimental design, data collection, data quality control, data analysis and interpretation, writing of the manuscript, editing of the manuscript, revision of the manuscript. AA Dias: experimental design and review of the manuscript. RS Rabelo, ID Cruz, SC Costa and FMN Nigri: data collection, data quality control, data analysis and interpretation.

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