ORIGINAL ARTICLE

OCCURRENCE AND CHARACTERISTICS OF ELDERLY WITH COVID-19 IN SOUTHERN BRAZIL

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Highlights: 1. 24.2% of elderly people a positive result in the RT-qPCR test for SARS-CoV-2. 2. Females had a higher proportion of positive cases compared to males. 3. A higher proportion of infected with pre-existing cardiovascular diseases.

PRE-PROOF

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ABSTRACT

This study aimed to describe the occurrence of COVID-19 in elderly patients treated at public health services in southern Brazil cities and their clinical and sociodemographic characteristics. This is a cross-sectional, observational, and retrospective study. From July 2020 to May 2021, medical records of elderly patients who underwent a test for COVID-19 at the molecular diagnostics laboratory of the University of Cruz Alta were selected. 310 elderly patients, with an average age of 60 to 99 years, were included in the study. Information was collected regarding the result of the RT-qPCR test, gender, symptoms, and comorbidities. We identified that 24.2% of the elderly evaluated in the study had a positive molecular diagnosis for COVID-19. The average age of the sample studied was 69 years (±8.89). Females had a higher proportion of positive cases (69.3%) compared to males (30.7%) (p=0.017). A higher proportion of individuals infected with SARS-Cov2 among those who reported cough, fever >37°C and pre-existing cardiovascular diseases (p = 0.028; 0.015; 0.017 respectively) was also identified. Learning the clinical and sociodemographic profile of the elderly with COVID-19 can contribute to strategies for care and prevention of the disease in this group. The study findings indicate that greater attention should be given to the elderly with heart diseases and those who have fevers and coughs.

Keywords: Test for COVID-19. Elderly Health. Comprehensive health care.

Ocorrência e características de idosos com Covid-19 no sul do Brasil

RESUMO

Este estudo teve como objetivo descrever a ocorrência de COVID-19 em pacientes idosos atendidos em serviços públicos de saúde de cidades do Sul do Brasil e as suas características clínicas e sociodemográficas. Trata-se de um estudo transversal, observacional e retrospectivo. Foram selecionados prontuários de pacientes idosos que realizaram teste para COVID-19 no laboratório de diagnóstico molecular da Universidade de Cruz Alta, no período de julho de 2020 a maio de 2021. Foram incluídos no estudo 310 pacientes idosos, com idade entre 60 e 99 anos. Foram coletadas informações quanto

ao resultado do teste RT-qPCR, sexo, sintomas e comorbidades. Identificamos que 24,2% dos idosos avaliados no estudo tiveram diagnóstico molecular positivo para COVID-19. A média de idade da amostra estudada foi de 69 anos (±8,89). O sexo feminino apresentou maior proporção de casos positivos (69,3%) em comparação ao sexo masculino (30,7%) (p=0,017). Identificamos uma maior proporção de indivíduos infectados com SARS-Cov2 entre aqueles que relataram tosse, febre >37ºC e doenças cardiovasculares pré existentes (p = 0,028; 0,015; 0,017 respectivamente). Conhecer o perfil clínico e sociodemográfico dos idosos com COVID-19 pode contribuir com estratégias de cuidado e prevenção da doença neste grupo. Os achados do estudo indicam que maior atenção deve ser dada aos idosos com cardiopatia e que apresentam febre e tosse.
Palavras-chave: Teste para COVID-19. Saúde do Idoso. Assistência integral à saúde.

INTRODUCTION

At the end of 2019, the World Health Organization (WHO) was alerted to the occurrence of a series of severe pneumonia cases, similar to viral pneumonia, which began in the city of Wuhan, China (Huang 2020)[1]. Through sequencing analysis of samples from the lower respiratory tract, it was discovered that it was a new, highly pathogenic and transmissible virus, which was identified as Severe Acute Respiratory Syndrome Coronavirus Virus 2 (SARS-CoV-2), responsible for the Coronavirus Disease 2019 (COVID-19)[1-2].

Due to its high transmissibility, the virus spread quickly and on January 30th, 2020 the WHO declared a public health emergency of international concern and, on March 11th, the COVID-19 pandemic was officially declared[2-3]. Since then, the numbers of cases and deaths related to the disease have increased significantly, showing the high incidence worldwide, with Brazil being one of the most affected countries, reaching the 3rd place in the world ranking[4].

The transmission of the virus occurs by direct person-to-person contact or by indirect contact through contaminated objects or surfaces[3,5]. Among the commonly reported symptoms are fever, cough, shortness of breath, anosmia and ageusia. However, some individuals, even those infected, may not have symptoms and still transmit the virus, which makes it difficult to contain the pandemic[3,6].

Through studies related to the pathogenesis of this disease, some risk factors associated with higher fatality rates from COVID-19 were considered, such as advanced age, the male gender, obesity, smoking, and presence of comorbidities[6-7].

WHO data and the literature indicate that the largest number of confirmed cases in the world is concentrated in the age range between 25 and 64 years, with an average age of 49 years. However, people aged 65 years and over, and/or with pre-existing diseases, had the highest death rates, with about 73% of the total deaths recorded, a situation that places them as one of the main risk groups for COVID-19[8-9]. The literature justifies age as a risk factor for the disease due to the lower responsiveness of the immune system and the senescence of the respiratory system with advancing age. Thus, considering the tropism of COVID-19 through this system, the elderly become more vulnerable to the respiratory complications of the disease and have greater difficulty in fighting the virus[6,8].

In fact, since the beginning of the pandemic, the literature has reported that SARS-CoV-2 infection affects all age groups[10], however, it has also been widely reported that the elderly is more susceptible to COVID-19, and those with underlying diseases, are considered a high-risk group[11]. Therefore, early diagnosis and individualized therapeutic management must be developed for elderly people, based on their clinical history and presence of comorbidities[12]. However, in Brazil, specific studies that investigated the clinical spectrum of COVID 19 in the elderly community population[13] are rare, covering other research focuses[14] and/or concentrating on in institutionalized elderly[15-19], a context similar to studies developed in the southern region of Brazil[20-22].

In view of the above, the present study sought to analyze the occurrence and characteristics of COVID-19 in an elderly population (elderly peoples aged 60 years or older) of the general community, in southern Brazil, aiming to contribute with epidemiological data on this disease in this age group.

METHOD

Study design and location

This is a cross-sectional, observational and retrospective study, developed with data obtained from exams registered in the system of a Molecular Diagnostics laboratory, which carried out the testing of suspected individuals for COVID-19, from July 2020 to

May 2021, in public health services in municipalities belonging to the Alto Jacuí and Alto da Serra do Botucaraí regions, which correspond to two of the twenty-eight regions that represent the Regional Development Councils (of Portuguese, COREDEs), in the state of Rio Grande do Sul, Brazil[23].

The individuals treated in this laboratory were citizens of the following places: Boa Vista do Cadeado, Boa Vista do Incra, Colorado, Cruz Alta, Espumoso, Fontoura Xavier, Fortaleza dos Valos, Ibirubá, Lagoa dos Três Cantos, Mormaço, Não-Me-Toque, Quinze de Novembro, Saldanha Marinho, Santa Bárbara do Sul, Selbach, Tapera, Tupanciretã and Victor Graeff. The total number of residents of this group of cities is 192.967 people, and of this total, 29.395 are elderly people aged 60 years or older[24]. Each of these municipalities had its own criteria for selecting individuals for testing, based on their epidemiological surveillance.

The diagnostic method adopted by the research laboratory was Charité[25] through detection of the virus E gene by the RT-qPCR technique, performed on nasopharyngeal and oropharyngeal swab samples. Samples were rejected when they didn't have an identification label, weren't accompanied by the exam request, had divergent information between the identification of the collection bottle and the exam request, had an incomplete number of swabs in the bottle or when the collection vials had some sort of breach.

For the exam result, the CT value (Cycle Threshold) of each sample was considered, positive samples being those with CT <35 for the E gene, inconclusive samples those with CT between 35 and 40 for the E gene and negative samples those without amplification, as previously validated by the laboratory.

Data collect

A retrospective survey was carried out of the data contained in the medical records of patients who underwent the test for COVID-19 using the RT-qPCR method, in the Molecular Diagnostics Laboratory of the University of Cruz Alta. The project was approved by the Research Ethics Committee, opinion No. 4,655,609. The secrecy and confidentiality of the data accessed in the laboratory records were ensured by the confidentiality agreement and the information collected was transcribed into a data collection instrument for exclusive use for the research, through a numerical system to catalog patient data, thus avoiding the use and identification of patients' names.

For the study, the following variables were collected: sex, age, body mass index (BMI), symptoms, comorbidities and RT-qPCR test results (dependent variable). Taking into account that the samples were collected and analyzed in a period when vaccination was not yet available or was only available for small groups, data regarding this variable were not collected.

Of the total of 3.872 exams performed in the research laboratory, only those referring to elderly patients aged 60 years or older were included in the present study, resulting in a final sample of 310 exams. Patients with inconclusive results were excluded from the research.

Statistical analysis

Data were compiled and analyzed using the SPSS® software (23.0 version, Chicago, IL Statistical Package for the Social Sciences). Percentage frequencies were calculated for all qualitative variables. Associations between these variables and positive results for COVID-19 were assessed using Pearson's chi-square or Fisher's exact tests, as appropriate. All estimates were bilateral with a pre-established level of significance for the alpha error of 5% ($p \leq 0.05$)

RESULTS

Of the 310 medical records of elderly patients evaluated, 75 (24.2%) had a positive RT-qPCR test for SARS-CoV-2. The age ranged from 60 to 99 years, with an average of 69 years (±8.89) and there were a higher proportion of COVID-19 infection among elderly females (69.3%) compared to males (30.7%) (p=0.017) (Odds ratio =0.015). The BMI variable does not present statistically significant differences between the groups (p=0.212) (Table 1).

Table 1 - Characterization of elderly people negative and positive for COVID-19

Variables	Total		COVID-19 Negative		COVID-19 Positive		*p** value
	No	%	No	%	No	%	
Sex							
Female	178	57.4	126	53.6	52	69.3	**0.017**
Male	132	42.6	109	46.4	23	30.7	
BMI**							
Underweight	4	1.6	3	1.5	1	1.8	
Normal	66	25.6	51	25.2	15	26.8	0.212
Overweight	85	32.9	61	30.2	24	42.9	
Obesity	103	39.9	87	43.1	16	28.6	

significant *p* values are highlighted

**The n does not correspond to the total of samples due to 52 requests not having this data filled in. BMI = body mass index

Regarding symptoms, 94% of the elderly had at least one clinical manifestation, as shown in table 2 that cough was reported by a total of 176 (56.2%) patients and that it was proportionally higher (67.1%) among the elderly with positive tests for COVID-19 (p=0.028) (Odds ratio =0.027). In addition, 148 (47.3%) of the elderly had fever >37.8°C in the laboratory records, and of these, the highest proportion (46.1%) was among those who tested positive for SARS-CoV-2 (p=0.015) (Odds ratio = 0.027) (Odds ratio =0.016).

Table 2 - Symptoms observed in negative and positive COVID-19 patients

Variables	Total		COVID-19 Negative		COVID-19 Positive		*p** value
	No	%	No	%	No	%	
Cough	176	56.2	125	52.7	51	67.1	**0.028**
Coryza	148	47.3	111	46.8	37	48.7	0.779
Fever >37ºC	108	34.5	73	30.8	35	46.1	**0.015**
Dyspnea	45	14.4	34	14.3	11	14.5	0.978
Body ache	156	49.8	114	48.1	42	55.3	0.277
Sore throat	174	55.6	128	54.0	46	60.5	0.320
Diarrhea	72	23.0	56	23.6	16	21.1	0.642
Headache	132	42.2	96	40.5	36	47.4	0.292
Abdominal Pain	6	1.9	4	1.7	2	2.6	0.635
Otalgia	1	0.3	1	0.4	0	0.0	0.571
Inappetence	8	2.6	5	2.1	3	4.0	0.405
Nasal congestion	8	2.6	7	3.0	1	1.3	0.685
Ageusia	15	4.8	10	4.2	5	6.6	0.371
Anosmia	13	4.2	11	4.6	2	2.6	0.741
Shortness of breath	4	1.3	4	1.7	0	0.0	0.576
Fatigue	29	9.3	24	10.1	5	6.6	0.495
Vomit	28	8.9	22	9.3	6	7.9	0.820

significant *p* values are highlighted

Finally, Table 3 presents the main comorbidities presented by the individuals tested. It is observed that the most reported comorbidities were obesity (24.6%) and hypertension (13.4%). However, only heart diseases presented a significant p result when comparing the positive and negative COVID-19 for elderly groups (Odds ratio =0.028) (Table 3).

Table 3 - Comorbidities observed in negative and positive COVID-19 patients

Variables	Total		COVID-19 Negative		positive COVID-19		*p** value
	No	%	No	%	No	%	
Comorbidities	134	42.8	96	40.5	38	50.0	0.146
Diabetes	15	4.8	12	5.1	3	3.9	0.692
Hypertension	42	13.4	31	13.1	11	14.5	0.756
Heart disease	11	3.5	5	2.1	6	7.9	**0.017**
Autoimmune disease	1	0.3	0	0.0	1	1.3	0.243
Asthma	5	1.6	3	1.3	2	2.6	0.598
Rhinitis	2	0.6	2	0.8	0	0.0	0.422
Bronchitis	3	1.0	2	0.8	1	1.3	0.567
Obesity	77	24.6	54	22.8	23	30.3	0.188
Depression	1	0.3	1	0.4	0	0.0	0.571
Hypothyroidism	6	1.9	5	2.1	1	1.3	0.661
Immunosuppression	3	1.0	2	0.8	1	1.3	0.713

significant *p* values are highlighted

DISCUSSION

The present study demonstrates that 24.2% of elderly people presented a positive result in the RT-qPCR test for SARS-CoV-2, with an average age of 69 (±8.89) years and a predominance of positive results in females. Most participants had symptoms, especially cough and fever among the positive cases. Furthermore, the most frequent comorbidities were obesity and hypertension, however, heart disease was associated with positive cases.

In view of the recent pandemic scenario caused by the SARS-CoV-2 virus, responsible for the COVID-19 disease, understanding characteristics associated with the disease and its risk factors has become fundamental for containing the pandemic and assisting the population. The elderly constitutes one of the main risk groups for morbidity

and mortality from COVID-19 and our study identified that the disease was diagnosed in 24.2% of the elderly tested for investigation of this disease in public services in southern Brazil, which corroborates with the study published by Barbosa, Galvão, Souza, Gomes, Medeiros, Lima[14] which demonstrated a proportion of COVID-19 cases in the state of Pará of 22.36%, similar to that found in our study.

There is evidence that the probability of infection by SARS-CoV-2 between men and women occurs in a similar way, however studies show a higher prevalence of positive cases in females, as observed in our study[26,27]. This may be related to the fact that the entry of SARS-CoV-2 into cells occurs through the angiotensin-converting enzyme (ACE2), which is located on the X chromosome, and consequently, females have higher levels of this enzyme, which may influence the greater female susceptibility to infection[27,28] . In addition, studies indicate that the elderly population makes great use of health services, and women seek doctor's appointments more due to several factors. Thus, another hypothesis to explain the greater occurrence of the disease in women would be due to the greater demand by the female public for health services and, consequently, the greater number of diagnoses of the disease[29,30].

We also identified a higher proportion of elderly people who had cough (p=0.028) and fever (p=0.015) among those with a positive test for the disease, corroborating other studies published in the literature[1,31-33], which cite fever and cough as initial and main symptoms of SARS-CoV-2 infection and serve as warning signs for the investigation of the disease as pointed out by the Pan American Health Organization (PAHO) together with the World Health Organization (WHO)[34].

Patients infected with SARS-CoV-2 often have a fever, with an elevation of body temperature above 37.8°C. This is due to the cytokine storm and the inflammatory reaction caused during infection, through the release of pro-inflammatory cytokines such as interleukin-1 (IL-1), interleukin-6 (IL-6) and tumor necrosis factor (TNF), which act as pyrogens causing the inflammatory response of fever[35-36]. In addition, cough is also a common symptom of COVID-19, arising from the ability of SARS-CoV-2 to infect peripheral sensory nerves in the vagus nerves, coughing mediators, leading to neuroinflammation and hypersensitivity mechanisms causing cough[37].

In addition, it is known that elderly patients have worse symptoms and lower survival rates due to COVID-19, this could be explained by the fact that with advancing age, the immune system remodels, becoming less responsive, which is crucial in fighting

infections[38]. Added to this, the elderly often has some type of comorbidity, which in turn ends up influencing the more severe progression of the disease, with hypertension, diabetes and heart disease being the most observed and described in the literature[39].

In our study, we observed a higher proportion of previous heart diseases among the elderly who were positive for COVID-19 than among those who were negative for the disease. This becomes relevant because studies confirm greater expression of the ACE2 gene in individuals with chronic diseases, which influences a greater chance of infection by SARS-CoV-2 and also a worse clinical course of the disease in patients with heart disease[40-42].

Our study had some limitations, among them, there was the difficulty in carrying out the return to the patients included in the study in order to verify the clinical outcome of those who had the disease. Furthermore, since data collection took place in a period when vaccination was not yet available, or was only available for some groups, data on immunization could not be included in the work. Furthermore, data collection (July 2020 to May 2021) comprised a period with various epidemiological scenarios of COVID-19 in Rio Grande do Sul and data analysis did not take into account whether the advancement of the age group would be related to more positive cases. Additionally, other limitations include the possibility of poor quality in filling out medical records, with incomplete data regarding clinical information or transcription errors, or even the low quality of collection of samples subjected to RT-qPCR testing, as they were carried out by different professionals, who were in a public health emergency context and, therefore, susceptible to work stress. The sample selection bias must also be considered, since the data were collected from individuals suspected of having COVID-19, but whose selection criteria were listed by each municipality studied. Even so, the information evidenced in our study can help in the planning, management and evaluation of COVID-19 surveillance actions, aimed at the elderly, within the regions analyzed.

CONCLUSION

The data presented support the objectives of the study and reinforce the need for special attention to elderly patients regarding the investigation of COVID-19, through the surveillance system of each municipality, especially those with heart disease, and that it's important to investigate the infection among those who report cough and fever.

Furthermore, our study contributes to the production of knowledge about COVID-19 in the southern region of Brazil and may instigate other investigations that address the clinical spectrum and comorbidities and their relationship with the prognosis of COVID-19 in elderly people from other regions of Rio Grande do Sul and in Brazil.

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