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COVID-19 (SARS-CoV-2) in Patients Treated in The Unified Health System (SUS) with Flu and Respiratory Symptoms from Three Brazilian Municipalities in the Border Region

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Original Research

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Abstract

Objective: The objective of this study was to investigate the prevalence and carry out epidemiology using sociodemographic data from patients with symptoms suggestive of coronavirus disease (COVID-19) (SARS-CoV-2) in 3 bordering Brazilian municipalities.

Methods: An epidemiological survey of positive cases of COVID-19 through reverse transcriptase polymerase chain reaction (RT-PCR) was carried out in 1874 patients, seen in the Unified Health System (SUS), ages between 0 and 99 years, who had symptoms suggestive of COVID-19, from the cities of Assis Chateaubriand, Tupãssi, and Formosa do Oeste.

Results: It was possible to observe that of the 1874 patients seen in the public health network of the 3 municipalities, 354 were diagnosed as positive. The predominance of cases was in female patients (51.97%) and in patients who lived in urban areas (93.50%), and the predominant age group was 20–29 years (19.78%).

Conclusion: The result of this study demonstrated the epidemiological profile of patients with respiratory and flu-like symptoms, positive for COVID-19, in 3 municipalities bordering Paraguay and Argentina. It was evident that the age group has its specificities regarding the susceptibility of the infection. Although the borders are closed, there was probably a spread of the virus in this region, due to the diversion, which showed an increase during the pandemic period.

The term *Epidemiological Surveillance* began to be used in 1966 and represents the study of a disease, understood as a process that encompasses any infectious agent, its possible reservoirs, vectors, and the host, as well as the mechanisms that facilitate the spread of infection and the extent to which this spread can occur.[1]

The new coronavirus named SARS-CoV-2 is the cause of COVID-19 and considered a disorder responsible for the severe acute respiratory syndrome (SARS). Its emergence took place in December 2019, at a seafood market in the Chinese city of Wuhan. On March 11, 2020, the World Health Organization (WHO) characterized COVID-19 as a pandemic.[2]

The disease can be transmitted by interpersonal contact through droplets containing the virus expelled by the infected individual through sneezing, coughing, or speaking. These droplets are inhaled by people close to the infected person.[3] It is assumed that the virus incubation time lasts, on average, 5 days. However, this period can extend up to the 14th day. Therefore, studies have shown that 86% of viral infections are carried out by asymptomatic individuals.[4] Besides, it is said that the droplets that contaminate objects and surfaces remain viable for several days. Despite this, the use of common disinfectants, such as sodium hypochlorite and hydrogen peroxide, cause their destruction.[5]

It is worth emphasizing the pandemic situation in the border bands since the Brazilian borders cover an extension of more than 23 000 km with 10 neighboring countries such as to the north, French Guiana, Suriname, Guyana, and Venezuela; to the northwest, Colombia; to the west, Peru and Bolivia; to the southwest, Paraguay and Argentina; and to the south, Uruguay.[6]

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From this extension, it is important to note that 15 900 km cover the land border, and in this extension by land, flows of people, animals, and goods continuously occur, the majority passing through border posts that, despite inspection, are a continuous source of possible dissemination of pathogens, as in this case, a virus.

Due to the pandemic related to the infection by COVID-19 (SARS-CoV-2) in humans from all over the world and its importance in border regions, the objective of this work was to carry out epidemiology using sociodemographic data of humans with symptoms suggestive of COVID-19 (SARS-CoV-2) in 3 municipalities in a Brazilian border region.

Material and Methods

Ethical Aspects, Study Site, and Sampling

This project was approved by Plataforma Brasil/Universidade Paranaense (UNIPAR) under protocol CAAE Nº 36777520.2.0000.0109.

An epidemiological survey of positive cases of COVID-19 (SARS-CoV-2) was carried out in patients treated by the Unified Health System (SUS) in 3 municipalities in the border region, all belonging to the Western Region of the State of Paraná (PR). The Brazilian border region was established under the name of the *Frontier Strip* in 1974, delimited 150 km from the international limit, respecting the municipal outline. The creation of this territory was made from the perspective of national security (MACHADO, 2005). Thus, the municipality of Assis Chateaubriand has a border with Paraguay (86 km), Argentina (143 km), and belongs to the 20th Regional Health Office, Paraná State Health Department (SESA-PR). The municipality of Tupãssi has a border with Paraguay (100 km), Argentina (130 km), and also belongs to the 20th Regional Health Office, Paraná State Health Department (SESA-PR). The municipality of Formosa do Oeste has a border with Paraguay (105 km) and belongs to the 10th Regional Health Office, Paraná State Health Department (SESA-PR).

Data collection on COVID-19 was carried out in all patients who voluntarily sought diagnostic assistance in the public health network of the respective cities. The period analyzed was from March 1 to August 31, 2020, which corresponds respectively to the periods between the 10th (March 1–7, 2020) and the 36th week (August 30, 2020 to September 5, 2020) of the 2020 epidemiological notification calendar, defined by the Ministry of Health.

After authorizations by the Health Departments of each municipality, the epidemiological survey of COVID-19 (SARS-CoV-2) was carried out by researching the official reports of patients who underwent molecular diagnosis, already established as a standard with the official health agencies. In addition to the molecular diagnosis, information that was present in the reports was also obtained.

Molecular Identification of SARS-CoV-2

Molecular exams to identify patients positive for COVID-19 (SARS-CoV-2) took place at the Central Laboratory of Paraná (LACEN/PR) and at the Institute of Molecular Biology of Paraná (IBMP).

The criteria established for carrying out the exams by LACEN/PR were patients hospitalized with SARS, according to the case definition—samples from the *Unidades Sentinelas do Programa SIVEP—Gripe*, respecting the agreed quantity of 5 samples/week and suspected deaths of COVID-19.

At IBMP, tests were performed on individuals diagnosed with flu-like syndrome who lived in the same household as a health or public safety professional; health professionals diagnosed with flu-like syndrome; public security professionals diagnosed with flu-like syndrome; older residents in long-term care facilities diagnosed with flu-like syndrome; long-term care workers diagnosed with flu-like syndrome; patients age 65 years or older with a diagnosis of flu-like syndrome; patients who presented comorbidities with flu-like syndrome; health institution workers diagnosed with flu-like syndrome; individuals diagnosed with flu-like syndrome and residents of communities (for example: neighborhoods, companies, and industries) with a high number of hospitalizations due to COVID-19; first cases of symptomatic individuals with flu-like syndrome and who attend closed environments for community use (for example: schools, prisons, and hospitals); workers in essential commercial services (for example: pharmacies, supermarkets, bakeries, and gas stations) diagnosed with flu-like syndrome; citizens using the SUS who spontaneously sought the health service, presenting symptoms for flu-like syndrome; and potential organ donors admitted to the intensive care unit (ICU) in a brain death protocol with an organ donation profile submitted to the RT-PCR exam for COVID-19 (SARS-CoV-2).

The main laboratory test available for the diagnosis of symptomatic patients, in the initial phase of COVID-19 (between the 3rd and 5th day of illness), was the RT-PCR molecular test in Real-Time (Reverse Transcription Polymerase Chain Reaction Quantitative Real-Time). According to the Brazilian Society of Clinical Pathology and Laboratory Medicine, the detection of the virus by RT-PCR in real-time remains the laboratory test of choice (gold standard) for the diagnosis of symptomatic patients in the early stage of the disease.

The biological material sent to the laboratories were swabs containing nasal and oropharyngeal secretions from each patient and stored in a viral transport medium for later delivery to the laboratory, according to the criteria mentioned above. The collection period took place in the acute phase of the disease, that is, up to 7 days after the onset of symptoms.

Lethality Rate Calculation

Lethality rate (%) = (Number of deaths due to COVID-19 recorded in the period × 100)/(Number of confirmed cases of COVID-19 in the same period).

The general lethality rate was calculated (considering the numbers of the 3 municipalities added together) and subsequently the lethality rate of each municipality separately.

Research Instrument

An epidemiological questionnaire was filled out with data on sex, age, residence, and month of attendance found in the official reports of each patient, extracted from the database, and aggregated information from the Municipal Health Secretariat of each of the 3 border municipalities (Assis Chateaubriand × Tupãssi × Formosa do Oeste). Only patients who tested for COVID-19 using the RT-PCR technique were included in the analysis.

Statistical Analysis

The results obtained after studying the variables (sex, residence, and age range) associated with the presence of COVID-19 (SARS-CoV-2) were subjected to statistical analysis using Pearson's chi-squared test (χ^2), Yates's chi-squared test, or

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Table 1. Sociodemographic data related to the 1874 patients who were treated with respiratory symptoms and later diagnosed with COVID-19 (SARS-CoV-2) through the public health network of 3 municipalities in the border region (Assis Chateaubriand, Tupãssi, and Formosa do Oeste—Paraguay x Brazil x Argentina borders) in the period from March to August 2020[a]

Patients treated with respiratory symptoms	Suspected cases from 3 municipalities n (%)	Suspected cases of Assis Chateaubriand n (%)	Suspected cases of Tupãssi n (%)	Suspected cases of Formosa do Oeste n (%)
Female	1010 (53.90%)	744 (53.72%)	177 (52.84%)	89 (57.80%)
Male	864 (46.10%)	641 (46.28%)	158 (47.16%)	65 (42.20%)
Total	1874 (100%)	1385 (100%)	335 (100%)	154 (100%)
Sex		Confirmed cases n (%)		
Female	184 (51.97%)	150 (53.58%)	20 (41.67%)	14 (53.85%)
Male	170 (48.03%)	130 (46.42%)	28 (58.33%)	12 (46.15%)
Total	354 (100%)	280 (100%)	48 (100%)	26 (100%)
Residence		Confirmed cases n (%)		
Urban area	331 (93.50%)	266 (95.00%)	41 (85.41%)	24 (92.30%)
Rural area	23 (6.50%)	14 (5.00%)	07 (14.58%)	02 (7.69%)
Total	354 (100%)	280 (100%)	48 (100%)	26 (100%)
Lethality rate (%)	2.25%	1.78%	2.08%	7.69%
Age group		Confirmed cases n (%)		
00–05 years	05 (1.41%)	04 (1.42%)	01 (2.08%)	01 (3.84%)
06–09 years	03 (0.84%)	02 (0.71%)	01 (2.08%)	00 (0.0%)
10–19 years	33 (9.32%)	24 (8.57%)	06 (12.50%)	03 (11.53%)
20–29 years	70 (19.78%)	59 (21.07%)	05 (10.41%)	06 (23.07%)
30–39 years	68 (19.20%)	57 (20.35%)	09 (18.75%)	12 (46.15%)
40–49 years	64 (18.08%)	51 (18.21%)	11 (22.91%)	02 (7.69%)
50–59 years	49 (13.84%)	40 (14.28%)	05 (10.41%)	04 (15.38%)
60–69 years	26 (7.35%)	18 (6.42%)	03 (6.25%)	05 (19.23%)
70–79 years	27 (7.63%)	19 (6.78%)	05 (10.41%)	03 (11.53%)
80 years and older	09 (2.55%)	06 (2.14%)	02 (4.16%)	01 (3.84%)
Total	354 (100%)	280 (100%)	48 (100%)	26 (100%)
Diagnostic confirmation month		Confirmed cases n (%)		
March	01 (0.28%)	01 (0.35%)	00 (0.0%)	00 (0.0%)
April	05 (1.41%)	04 (1.42%)	01 (2.08%)	00 (0.0%)
May	12 (3.38%)	09 (3.21%)	03 (6.25%)	00 (0.0%)
June	100 (28.40%)	71 (25.35%)	26 (54.16%)	03 (11.53%)
July	114 (32.02%)	96 (34.28%)	00 (0.0%)	18 (69.23%)
August	122 (34.46%)	99 (35.35%)	18 (37.5%)	05 (19.23%)
Total	354 (100%)	280 (100%)	48 (100%)	26 (100%)

[a]Elaborated by the authors.

Fisher's exact test, using the statistical program BioEstat 5.0[7] at the level of 5% of significance.

Results

In the 3 Municipal Health Departments of the municipalities in the border region of this study, 1874 patients ages 20 days to 99 years with respiratory symptoms were treated, of which 354 (18.89%) tested positive for COVID-19 (SARS-CoV-2) (Table 1).

Regarding the place of residence of the tested patients, 1757 (93.75%) lived in the urban area and 117 (6.25%) in the rural area. As for sex, 864 (46.10%) were men and 1010 (53.90%) were women. In addition, it was possible to observe the care provided to 137 (7.31%) children, with ages varying from 20 days to 15 years.

Among the 354 patients who tested positive for COVID-19, 170 (48.03%) were male and 184 (51.97%) were female. Also, of the total positive cases, 331 (93.50%) lived in the urban area and 23 (6.50%) lived in the rural area.

Regarding the place of residence, among the patients who tested positive for COVID-19 and who lived in the urban area, 157 (44.35%) were male, and of these, 9 (5.75%) were children. Besides, 197 (55.65%) were female, of which 8 (4.06%) were children. In the rural area, of the 23 patients who tested positive for COVID-19, 14 (60.86%) were men, 2 (14.28%) children, and 9 (39.14%) were women, 1 (11.11%) child.

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Table 2. Variables associated with infection by COVID-19 (SARS-CoV-2) through the public health network of 3 municipalities in the border region (Assis Chateaubriand, Tupãssi, and Formosa do Oeste—Paraguay x Brazil x Argentina borders) in the period from March to August 2020[a]

Sociodemographic data		Positives for COVID-19 (n, %)	*P* value	Odds ratio (IC 95%)
Sex	Male	170/864 (19.67%)	0.4565*	1.0996 (0.8723-1.3863)
	Female	184/1010 (18.22%)		
Residence	Rural area	23/117 (19.65%)	0.9225*	1.0541 (0.6579-1.6889)
	Urban area	331/1757 (18.84%)		
Age group	0-29 years	111/800 (13.87%)	0.0001**	—
	30-59 years	181/841 (21.52%)		
	≥ 60 years	62/233 (26.61%)		

[a]Elaborated by the authors.
*Yates's chi-squared test; **Pearson's chi-squared test.

Table 3. Variables associated with COVID-19 (SARS-CoV-2) infection through the public health network in the municipality of Assis Chateaubriand, which borders Paraguay (86 km) and Argentina (143 km) in the period, March to August 2020[a]

Sociodemographic data		Positives for COVID-19 (n, %)	*P* value	Odds ratio (IC 95%)
Sex	Male	130/641 (20.28%)	0.9905*	1.0075 (0.7745-1.3104)
	Female	150/744 (20.16%)		
Residence	Rural area	14/58 (24.13%)	0.5534*	1.2691 (0.6853-2.3504)
	Urban area	266/1327 (20.04%)		
Age group	0-29 years	89/607 (14.66%)	0.0001**	—
	30-59 years	148/628 (23.56%)		
	≥ 60 years	43/150 (28.66%)		

[a]Elaborated by the authors.
*Yates's chi-squared test; **Pearson's chi-squared test.

The general lethality rate (regardless of another characteristic) showed a result of 2.25% when adding the numbers of deaths of the 3 border municipalities and calculated in relation to the total number of positive patients from the 3 municipalities together. Subsequently, the lethality rate was calculated for each municipality separately, where Assis Chateaubriand had a lethality rate of 1.78%, Tupãssi of 2.08%, and Formosa do Oeste of 7.69%.

Regarding epidemiological variables, it was found that positivity for COVID-19 in the 3 municipalities in the border region (Assis Chateaubriand, Tupãssi, and Formosa do Oeste) differed in relation to age groups ($P \leq 0.0001$) (Table 2).

There was no significant difference between the positivity of COVID-19 in relation to sex, or in relation to the area of residence.

Table 3 shows that positivity for COVID-19 differed in relation to age groups ($P \leq 0.0001$) in the municipality of Assis Chateaubriand. Thus, the results demonstrated that the differences in the age groups occurred when comparing the age group ≥ 60 years and 0–29 years ($P \leq 0.0001$) and 30–59 years and 0–29 years ($P \leq 0.0001$), with no differences between the age groups of 30–59 and ≥ 60 years ($P = 0.1202$).

There was no significant difference between the positivity of COVID-19 in relation to sex, or in relation to the area of residence.

Related to Tupãssi and Formosa do Oeste, no variable was statistically significant.

Discussion

The pandemic of COVID-19 (SARS-CoV-2) must be understood in the current context as the result of the impact of the factors that involve the relations of the human being, animals, and nature. Just as technology and science have evolved, population dynamics and the accelerating growth in the need for food production coexist with the challenge of maintaining the environment. The emergence of the new coronavirus can also be attributed to a Chinese eating habit, also present in other countries: the consumption of fresh meat from domesticated and wild animals.[8] In this sense, One Health appears as an opportunity to assess and understand the current needs of the world, in addition to providing the perception that the interactions between environmental, animal, and human health are a key element for the emergence of many other emerging diseases.[9–11]

The pandemic as a real fact is a border problem and, in the case of SARS-CoV-2, it is already known that the virus entered Brazil through an airport, installed itself in cities with a greater relationship and connection with other countries, and quickly spread throughout Brazilian territory.[12]

The border region of western Paraná has been the destination of countless immigrants since the beginning of the 21st century, among them Paraguayans, Argentines, Uruguayans, Haitians, Africans, among others.[13] The accelerated local demographic growth is evident in the 1950s and 1960s. This occurred due to large internal immigration flows that moved there, coming from several Brazilian states, especially from Santa Catarina, Rio Grande do Sul, and São Paulo.[14] In addition, the West region of Paraná has municipalities with an estimated population of more than 1 million and 300 000 inhabitants.

According to the results obtained in the present study, the first patients with suspected clinical symptoms of COVID-19 from the

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3 border municipalities appeared in March 2020, with the first positive cases reported being, respectively: Assis Chateaubriand (March 31), Tupãssi (April 12), and Formosa do Oeste (June 11). It is important to note that all 3 municipalities in this work are bordered by Paraguay. Studies by Ruiz et al.[15] in Paraguay reported the first case of COVID-19 on March 7,[16] and as of June 30, 2221 cases had been confirmed in the country.

The results of these studies may have been influenced by the difference in the prevalence of this disease in the respective study sites, in addition to reflecting the different local situations, such as the fact that they belong to a border region or climate changes or even international travel of people, which may have a greater or lesser chance of infection occurring in this period. The measures to prevent COVID-19 involved surveillance at ports, airports, and borders. In Brazil, at the beginning of March 2020, some restrictions were introduced for foreigners to enter the country across land and air borders. However, other countries have decided to close their borders, some partially (keeping it open to nationals and resident migrants) while other countries remain totally closed, including to nationals.[17,18]

Despite the temporary closure of borders as a way to prevent the spread of the virus, another important point that draws attention is the illegal trade of products and goods. Paraná has 139 municipalities on the Brazilian Frontier Strip, among them, 97 are located in the western region of the state. The state also has an international border line of 447 km, with 208 km with Paraguay and 239 km with Argentina.[19] Amaral[20] and Barbosa[21] declare that this region is considered a strong point of illegal trade of all types, since it has a strategic connection with cities with a large flow of trade, such as Foz do Iguaçu, Cascavel, and Toledo, as previously mentioned. Thus, this situation of illegal trade may also have contributed to the spread of the virus, since virus transmission can occur between traders and buyers of these illegal objects.[3,22,23]

The results are not yet conclusive, but some studies suggest that there is a negative correlation between humidity and temperature. According to a survey conducted by Chatkin and Godoi,[24] it was shown that climatic conditions can be directly related to the presence of COVID-19. Wu et al.[25] reported in a study carried out in 166 countries that the 1°C increase in temperature was associated with a 3.08% reduction in new daily cases. Besides, they also stated that the 1% increase in relative humidity was related to daily reductions of 0.85 for new cases, which could explain an increase in the number of cases in the months of July and August. Another study carried out in the 26 capitals of Brazilian states and in the Federal District showed a negative linear relationship between the number of confirmed cases of COVID-19 and the temperature in the range between 16.8 and 27.4°C. The authors concluded that for each degree of temperature increase, there was a variation of -4.8951% in the number of confirmed accumulated cases, with the curve reaching a plateau after 25.8°C.[5,26]

According to the Paraná State Department of Health (SESA-PR),[27] until August 27, 2020, among the 31 947 (100%) cases of severe acute respiratory syndrome (SARS) registered in the state, 11 106 (34.8%) had SARS-CoV-2 as the etiologic agent. The remaining cases were diagnosed as SARS caused by influenza (0.3%), SARS caused by other respiratory viruses (adenovirus, respiratory syncytial virus, metapneumovirus, and rhinovirus) (2.7%), SARS by other etiologic agents (0.1 %), and unspecified SRAG (50.6%), a classification that serves to account for cases with negative results by the tested agents and for cases where there was no collection of biological material to be sent to the laboratory. No hospitalized cases that enter the database are discarded; all are SRAG. According to the epidemiological bulletin, 3700 cases (11.6%) were still under investigation at the present date. These data demonstrate that since COVID-19 and other respiratory diseases have different treatments and prognoses, it is important that the diagnoses are made correctly. Patients with respiratory or flu-like symptoms should be evaluated for differential diagnosis of coronavirus, due to similarities between symptoms and virus transmission, to measure the epidemiological impact caused by these diseases.

Among the 354 patients positive for COVID-19 in the present study, 93.50% lived in the urban area and 6.50% in the rural area, a result similar to that demonstrated by Araújo et al.,[28] in Teresina, state of Piauí, where they also detected a higher prevalence (99.37%) in the urban area than in the rural area (0.63%). The higher prevalence in the urban area can be attributed to the greater circulation of people and availability of services. Also, in these regions, the occupational density of residences is higher when compared to rural areas, and measures of social isolation and quarantine become more difficult tasks to be carried out, which may contribute to the emergence of new cases.[29]

In Tupãssi, the first positive case in the rural area occurred on May 21. In Assis Chateaubriand, June 5. Finally, in Formosa do Oeste, on June 11, 2020. The municipalities in this study, mainly Tupãssi, have a very busy route with the municipalities of Toledo and Cascavel, with a high number of residents who travel to neighboring municipalities to work, mainly in large industries related to different agribusiness activities, such as grain outlets and animal slaughterhouses. These facts could explain why that municipality was the first to report a positive case of COVID-19 in the rural area.[14]

According to Rascombe[30], infectious diseases, in the vast majority, spread through transport routes causing people to move from the places of greatest concentration to less densely populated communities, such as inland towns and, subsequently, rural areas. A study carried out in the state of Santa Catarina by Viana et al.,[31] showed that from the second half of April, the number of confirmed cases of COVID-19 began to increase in the interior cities. In the same period, the first cases began to appear in the smaller cities and in the rural population of the West, Midwest, and Mesoregion of the State, with an increase of almost 0.5% of cases in the rural area in 2 months, a similar situation to this job.

Jaillon et al.[32] report that women have innate and adaptive immune responses that are more effective than those of men. For this reason, women are more resistant to infections and also become less susceptible to viral infections due to the X chromosome and sex hormones.[33] However, according to the data in this study, until August 31, 2020, the prevalence of positive cases for COVID-19 was higher in females (51.97%), a result that corroborates results of Silva et al.,[5] in Macapá, Almeida et al.,[34] in Maranhão, and Araújo et al.,[28] in Piauí, that detected 51.63%, 52%, and 55.56%, respectively. The higher prevalence in women can be explained by the fact that they represent the workforce in different health segments, that is, professionals in the front line of coping with the disease, which has a high rate of infected people across the country. These data are demonstrated by the epidemiological bulletin of SESA-PR, where among the 130 500 confirmed cases of COVID-19 in the state, 6879 (5.27%) are cases of health workers. Among these cases, 3025 (43.97%) are from nursing professionals, a profession dominated by women.[27,35]

Unlike the results of this study, Ruiz et al.[15] reported that Paraguay, a neighboring country bordering the 3 municipalities in this study, presented 74% of cases in males. In another survey

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by Rojas,[36] also in Paraguay, infection rates were also higher for males (57%). These data may possibly be associated with their behavioral and occupational habits in that country. According to a study by Gutiérrez et al.,[37] the unemployment rate of women during the pandemic in many Latin American countries, including Paraguay, was higher when compared to the rates of men, showing that men represent, until now, the labor force most present in essential activities in this period. The pandemic experience has shown that quarantines have considerably reduced economic and subsistence activities, in addition to having affected sectors that generate jobs for women, such as trade or tourism, in many countries in Latin America.[37]

In relation to age, when calculated in relation to the numbers of positive cases, the municipalities had a higher number of cases in individuals ages 20–29 years (19.78%), followed by the age group 29–30 years (19.20%). In a study by Ruiz et al.,[15] the largest number of cases occurred in the 20 to 29 age group, corroborating this study. However, a study by Araújo et al.,[28] in Piauí, showed that the largest number of infected people was concentrated in the age group of 30 to 39 years. In this study, when the sociodemographic variables were analyzed, the age group data showed statistical significance ($P \leq 0.0001$), showing that there was a significant difference in individuals ages 30–59 years compared to individuals ages 0–29 years old, indicating that the 30–59 age group has a 1.7023 times more chance of becoming infected.

These figures show that the predominant age groups of those infected are individuals considered to be economically active. This means that they may be more exposed to different environments and ways of working, which may be the focus of the increase in the transmission chain of COVID-19, and are also involved in commuting and transit activities, being more susceptible to infections.[28,38]

When analyzed, the age group data showed significance ($P \leq 0.0001$), demonstrating that the differences in the age groups occurred when comparing the age group ≥ 60 years and 0–29 years. This indicates that individuals age 60 years or older are 2.2506 times more likely to be infected, compared to individuals ages 0–29 years. These data corroborate the study by Flores and Lampert[39] and Liu et al.[40] who show that individuals over 60 years old represent the risk groups for this infection, being exposed to higher numbers of diseases and higher mortality due to COVID-19 when compared to younger age groups.

Globalization appears as an intervening vector of intense dynamics of trade, transport, and migration that facilitate pathogenic microorganisms to cross national borders at an intense speed. Globalization implies not only shared risks, but also joint responses to global issues, such as today's and future epidemics. Therefore, it is essential to reflect on the border dynamics and how health and borders are combined in the horizon of COVID-19.

Limitations

There were limitations to this study that deserve discussion. The study was developed at the beginning of the COVID-19 pandemic, a situation that made it difficult to tabulate the data, due to the demand of the notification systems.

Two other municipalities located in a border region were invited to participate in the study, but due to the work overload in the health system, they were not able to assist in the collection of information.

Time was also another major constraint. It was necessary to open all SINAN forms to collect epidemiological data and laboratory results. With systems collapsed due to lack of staff and a large number of patients under investigation, the study had to be limited to a specific period, more than the beginning of the pandemic, so that all records could be evaluated more carefully, in a satisfactory way. and with confidence. The delay in releasing the results, due to the great demand of patients, also made it difficult to extend the investigation period. Finally, the lockdown was another important factor that generated limitations to the study. With the impossibility of face-to-face meetings, much information that could contribute to enrich the work was not possible to acquire and later tabulate.

Conclusions

The use of official data registered in the respective Municipal Health Departments was essential for the understanding of epidemiological data (housing, age, sex). Subsequently, these data will assist in the implementation of different health education actions for the local community. In addition, these results demonstrate the importance of the academy's research partnership with the Health Departments of Assis Chateaubriand, Tupãssi, and Formosa do Oeste to awaken in other spheres of public power the importance of this demand, which is to join efforts for the realization of projects that effectively contribute to the improvement of One Health and municipal, regional, or even state development.

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