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Analysis of the epidemiological profile of confirmed cases of COVID-19 in the Ribeira Valley, São Paulo, Brazil

Análise do perfil epidemiológico dos casos confirmados de COVID-19 no Vale do Ribeira, São Paulo, Brasil

Análisis del perfil epidemiológico de casos confirmados de COVID-19 en Vale do Ribeira, São Paulo, Brasil

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ABSTRACT

Introduction: Knowing the epidemiological profile of COVID-19 can assist in decision making to stop the pandemic. In this context, the objective of this study was to analyze the epidemiological profile of COVID-19 cases in Ribeira Valley, SP, Brazil **Outline:** Epidemiological survey in a secondary database on COVID-19 cases in Vale do Ribeira, until August 15, 2020. **Results:** 4,873 cases of COVID-19 were recorded, of which 108 died. Among the confirmed cases, females predominated, from 20 to 59 years old, with heart disease. Deaths occurred more frequently in males, aged over 60 years old, with heart disease. The lethality rate was 2.22% and it was found that the greater the demographic density of the municipality, the greater the number of cases and deaths. **Implications:** The growing trend in the number of new cases and deaths due to COVID-19 in the Vale do Ribeira provides a warning signal for the need to periodically evaluate the success of the prophylactic measures adopted in the region. Therefore, the dissemination of epidemiological data on the disease, combined with preventive measures, must be reinforced to avoid the collapse in the health system and economic activity in the region.

DESCRIPTORS

Pandemics; Coronavirus Infections; Epidemiology; Public Health Surveillance.

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INTRODUCTION

In late December 2019, an outbreak of respiratory infection previously unknown to the medical and scientific community began to manifest itself in humans in the city of Wuhan-Hubei-China.[1] Difficulties in controlling the disease by conventional methods of treatment suggested a new infectious disease with viral characteristics and effective transmission from person to person. Shortly thereafter, and with the support of the international scientific community, especially from China, it was confirmed that the new disease, called COVID-19 (Coronavirus Disease 2019), was caused by a coronavirus initially called 2019n-CoV (novel coronavirus 2019) and, after genomic analyzes, such as SARS – CoV-2 (Coronavirus that causes Severe Acute Respiratory Syndrome Type 2), responsible for the pandemic declared in early March 2020 by the World Health Organization (WHO).[2]

The novel coronavirus spreads more easily from person to person through droplets expelled through the nose or mouth, when a contaminated person with high viral loads coughs, sneezes or speaks.[2] Such droplets can contaminate objects and surfaces around the person, such as tables, door handles and handrails, which can lead to indirect contamination, resulting from the contact of the hands with contaminated places and, subsequently, contact of the hands with the eyes, nose or mouth. , main routes of entry of the virus.[2] In this sense, washing them regularly with water and soap or 70% alcohol, cleaning the surfaces, using a mask and maintaining social distancing are very effective measures in controlling transmission.[2-3]

People infected with SARS-CoV-2 will not always develop COVID-19, as they may be asymptomatic and, once they develop the disease, they may have mild, moderate or severe symptoms.[4] Mild or moderate symptoms such as cough or low to moderate fever indicate the need to seek a diagnosis and, mainly, to isolate oneself and monitor the evolution of the clinical picture. The immediate search for hospital care must occur in severe cases, in which patients have difficulty breathing, and there is still no consensus on a safe and effective treatment for the disease.[2]

In Brazil, the first case was confirmed on February 26, 2020, in an elderly resident in São Paulo who had previously traveled to Italy. Since then, the Ministry of Health has been making efforts to contain the spread of the virus.[3] Among the actions carried out, there is the dissemination of information regarding the epidemiological situation in the country.[5] Thus, knowing the epidemiological profile of the different regions of Brazil is necessary for the elaboration and implementation of strategies to reduce the spread of the novel coronavirus.

According to WHO data, on August 16, 2020, 21,260,760 confirmed cases of COVID-19 and 761,018 deaths had been recorded worldwide. The country with the highest prevalence of the disease is the United States, followed by Brazil, India and Russia.[6] In Brazil, to date, 3,340,197 confirmed cases have been recorded, with approximately 23,000 new daily cases, with an incidence of 1,589.5 cases per 100,000 inhabitants, 107,852 deaths recorded, with more than 600 daily deaths, totaling a rate of lethality of 3.2%.[7]

Regarding measures to contain the spread of the pandemic in Brazil, the continental dimension of the country in association with its cultural and economic diversity reflects on the reflection that the procedures adopted in a uniform manner will not always be compatible with the local reality.[3] Thus, decision-making about the management of the pandemic must be based on the epidemiological analysis of each region and guided by the recommendations of the State, the Union and the WHO.

It is evident that global contamination by the novel coronavirus represents a historic challenge for public health, directly impacting the lifestyle of the world population due to the obstacles imposed by the fight against the pandemic caused by COVID-19. In addition, this pandemic challenges the scientific community to seek immediate solutions that can control the spread of the disease and reduce the biological, social and economic impacts on society.

Therefore, knowing the behavior of the disease in different regions of Brazil and the world makes it possible to predict strategies according to the specificities of each location. It is in this context that this study aimed to analyze the epidemiological profile of COVID-19 cases in Vale do Ribeira, SP, Brazil.

METHOD

This is a descriptive epidemiological survey carried out using secondary data from confirmed cases of COVID-19 in the Vale do Ribeira, specifically in the 15 municipalities that are part of the Regional Health Department (DRS XII - Registro-SP), responsible for the care of an estimated population of 284,509 inhabitants.[8]

The data on COVID-19 used in the study were extracted from the data panel of the State System of Data Analysis Foundation (SSDAF), whose source of information is the Epidemiological Surveillance Center (ESC); the Disease Control Coordination (DCC) and the State Department of Health (SDH), bodies linked to the State of São Paulo, Brazil.[9] Data on demographic density (Inh / km^2) and estimated population were also used, consulted on the website of the Brazilian Institute of Geography and Statistics (BIGE).[8]

Data collection corresponded to the period from April 4 to August 15, 2020, whose data were updated on 8/15/2020 at 3:30 pm. The stipulated period includes the interval between the notification of the first case in Vale do Ribeira until the moment of data collection, with these data available at the search site. In the data panel, the following information was extracted: sex, age group, preexisting diseases, municipality of origin, number of confirmed cases, deaths and mortality rate.

After organizing the data in a Microsoft Excel® spreadsheet, a descriptive analysis was performed in absolute and relative frequency of the variables investigated using the *Statistical Package for the Social Sciences* (SPSS) version 20.0. In addition, the Pearson Correlation Test was used to identify a possible association between the demographic density of the municipalities of Vale do Ribeira and the confirmed cases of COVID-19 in the region, being used, in the analysis, the *Software Graph Pad Prism version* 5.0 (Graph Pad Software, Inc., San Diego, CA, EUA). In the correlation analysis, $p \leq 0.05$ was considered as the significance limit.

As this is a study using secondary data available on a public domain portal, this research was not submitted for consideration by a Human Research Ethics Committee (HREC). However, all ethical precepts related to the norms and guidelines of the Resolution of the National Health Council (CNS) nº 466/2012 were fulfilled.

RESULTS

After 134 days of confirmation of the first case of COVID-19 in the Vale do Ribeira, on August 15, 2020, the region accounted for 4,873 cases of the disease, among which 108 died. The daily average of confirmed cases and deaths in the last seven days was 114.29 and 2.57, respectively. Most were female, aged 20 to 59 years old, with heart disease, from the municipalities of Cajati and Registro (Table 1). The municipality with the lowest number of confirmed cases was Iporanga, with a record of 27 cases until the time of data collection.

Regarding the number of deaths, the majority occurred in males, aged over 60 years old, with a history of heart disease, with a higher frequency of deaths in the municipality of Registro, followed by the municipality of Cajati (Table 1). The lethality rate in the region was 2.22%. Among men, the lethality rate was 2.7%, exceeding the lethality rate among women (1.7%). The occupancy rate of the hospital beds was 47.0% and the ICU 38.8%, with the availability of 14 ICU beds COVID-19 per 100 thousand inhabitants.

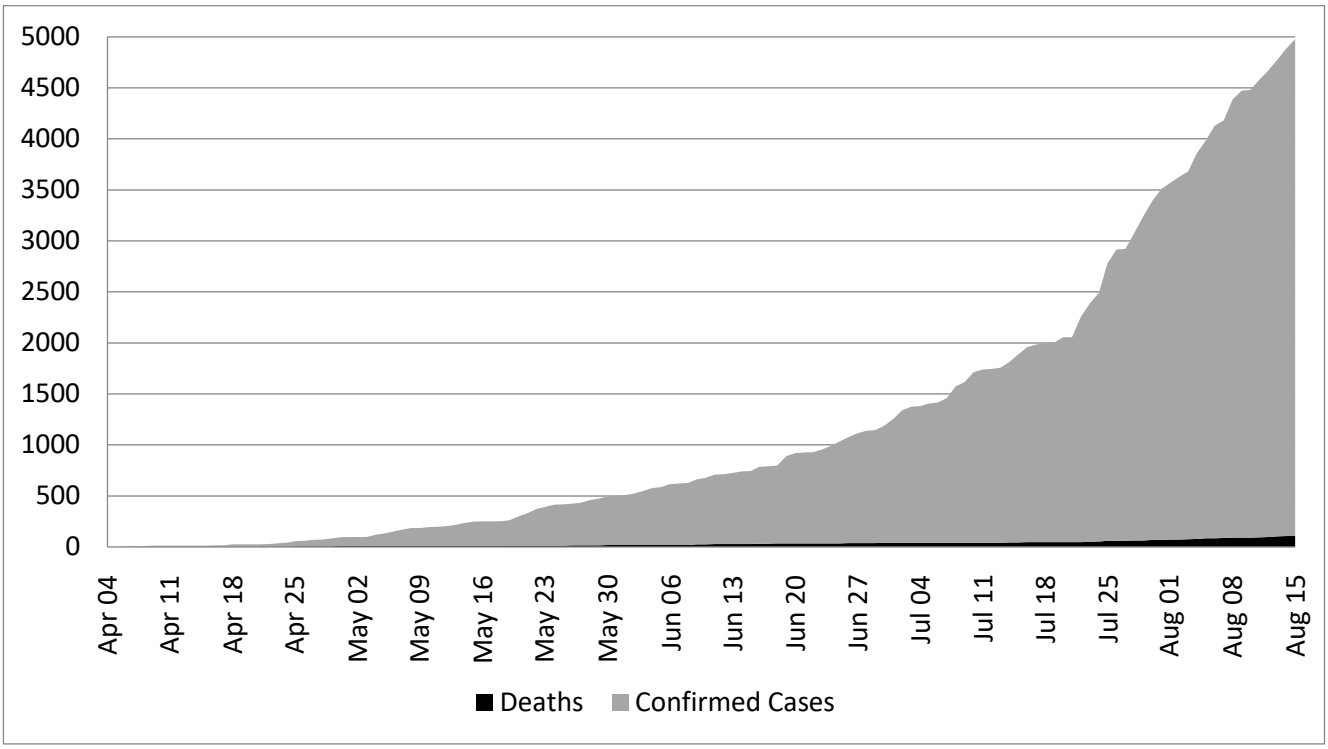
Table 1 – Characterization of confirmed cases and deaths of COVID-19, according to sex, age group, preexisting diseases and municipality of origin in Vale do Ribeira (N = 4,873).

Variable	Confirmed cases (N = 4,873)		Deaths (N = 108)	
	(n)	(%)	(n)	(%)
Sex*				
Male	2292	47.0	63	58.3
Female	2579	52.9	45	41.7
Age group*				
Up to 10 years old	109	2.2	1	0.9
11 to 19 years old	260	5.3	1	0.9
20 to 59 years old	3836	78.7	24	22.2
Over 60 years old	664	13.6	82	75.9
Preexisting diseases				
Heart disease	132	2.7	54	50.0
Diabetes	102	2.1	36	33.3
Neurological disease	11	0.2	5	4.6
Obesity	31	0.6	10	9.3
Kidney disease	17	0.3	11	10.2
Pneumopathy	21	0.4	10	9.3
Immunodepression	7	0.1	1	0.9
Asthma	5	0.1	0	0.0
Hematological disease	5	0.1	1	0.9
Liver disease	4	0.1	2	1.9
Municipality				
Barra do Turvo	75	1.5	2	1.9
Cajati	1277	26.2	16	14.8
Cananeia	130	2.7	7	6.5
Eldorado	218	4.5	4	3.7
Iguape	338	6.9	7	6.5
Ilha Comprida	78	1.6	5	4.6
Iporanga	27	0.6	0	0.0
Itariri	179	3.7	4	3.7
Jacupiranga	296	6.1	8	7.4
Juquiá	219	4.5	5	4.6
Miracatu	241	4.9	13	12.0
Pariquera-Açu	488	10.0	7	6.5
Pedro de Toledo	44	0.9	1	0.9
Registro	1067	21.9	22	20.4
Sete Barras	196	4.0	7	6.5

***The available data sheet did not include the age of four people and the sex of two people.
Note: Information on preexisting diseases is available for about 15% of cases and for 80% of deaths. This important data failure can skew analyzes related to the identification of COVID-19 with preexisting diseases.
Source: https://www.seade.gov.br/coronavirus/

Graph 1 shows the evolution in the number of cases and deaths by COVID-19 in 15 municipalities in Vale do Ribeira, since the confirmation of the first case in the region.

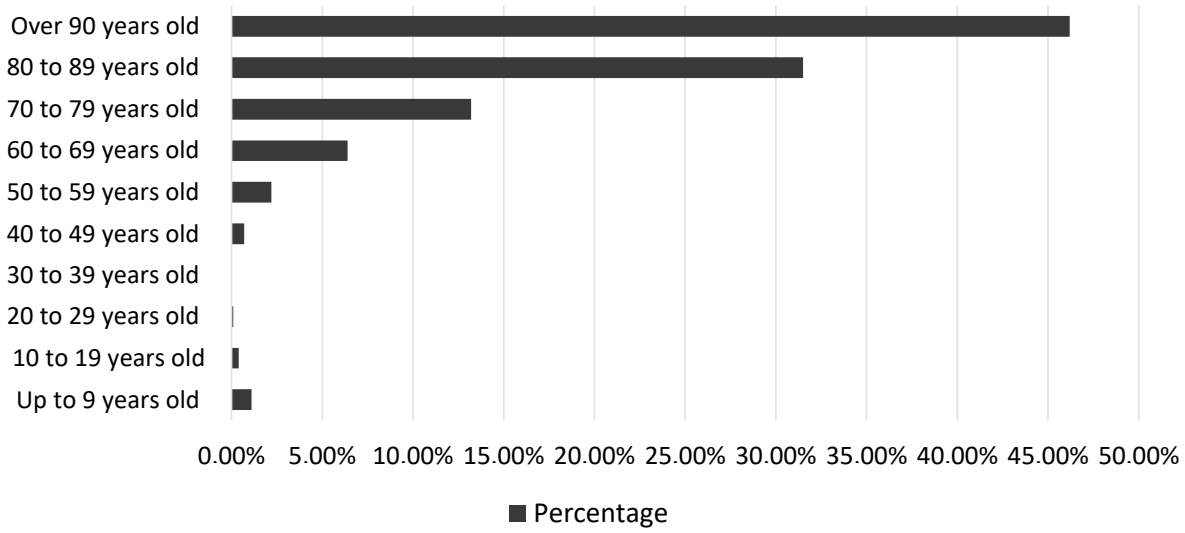
Graph 1 – Evolution in the total number of confirmed cases and deaths of COVID-19 in Vale do Ribeira.



Source: https://www.seade.gov.br/coronavirus/

The lethality rate of COVID-19 in Vale do Ribeira was higher in the population aged ≥ 60 years old, reaching values close to 50% of lethality in the age group above 90 years old (Graph 2).

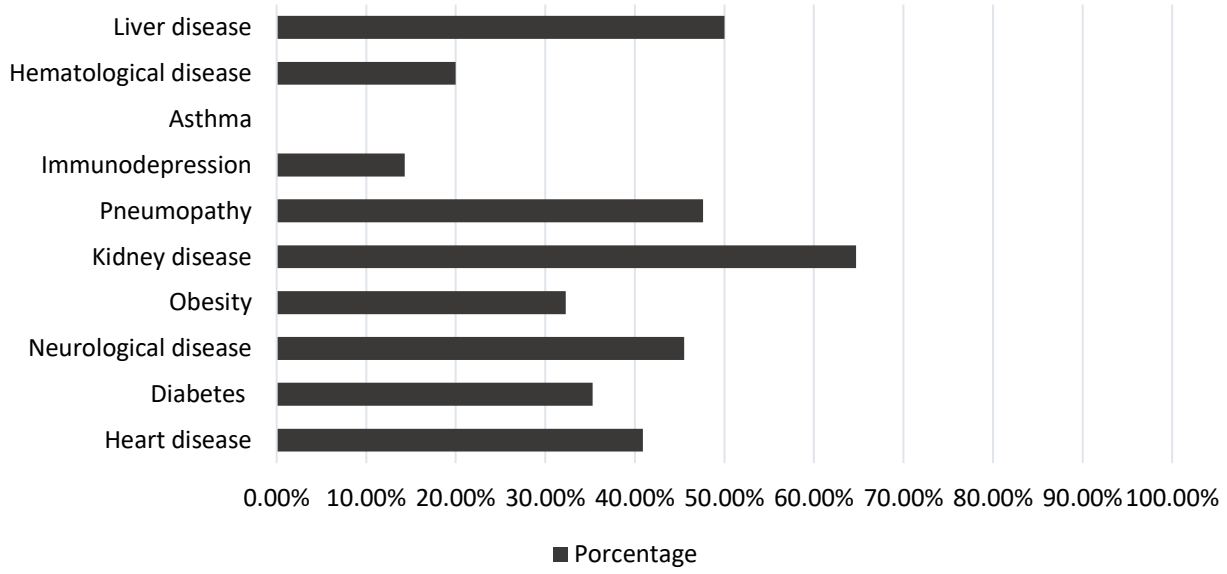
Graph 2 – Lethality rate of COVID-19, according to age group in Vale do Ribeira.



Source: https://www.seade.gov.br/coronavirus/

Among the patients who died, the lethality rate was respectively higher in those who had kidney disease, liver disease, pneumopathy, neurological disease, heart disease and diabetes (Graph 3).

Graph 3 – Lethality rate of COVID-19, according to preexisting diseases in Vale do Ribeira.

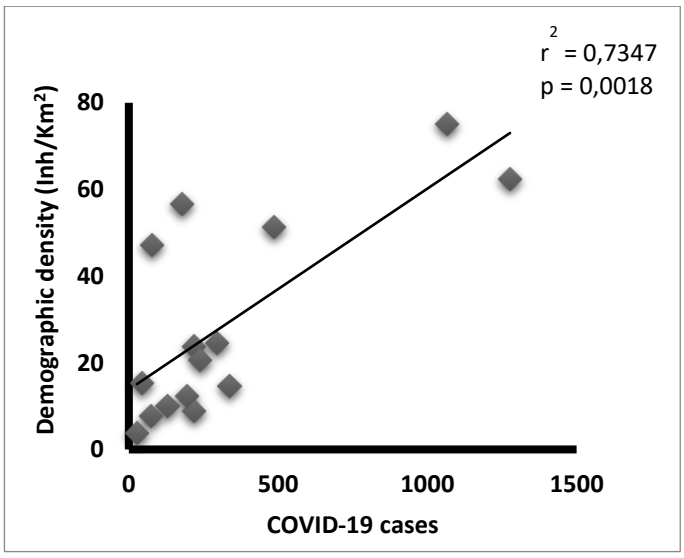


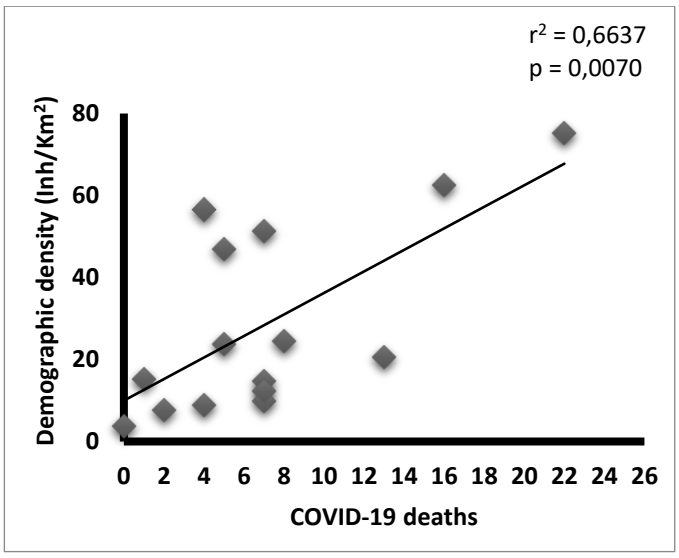
Note: Information on preexisting diseases is available for about 15% of cases and for 80% of deaths. This important data failure can skew analyzes related to the identification of COVID-19 with preexisting diseases.

Source: https://www.seade.gov.br/coronavirus/

The 15 municipalities analyzed have a demographic density that varies between 7.67 Inh/km^2 (Barra do Turvo) and 75.11 Inh/km^2 (Registro). The significant correlation between the demographic density of the municipalities of Vale do Ribeira and the number of confirmed cases and deaths of COVID-19 in the region reveals that the greater the demographic density, the greater the number of cases and deaths associated with the disease (Graph 4).

Graph 4 – Dispersion diagram for correlation analysis between demographic density and the number of confirmed cases of COVID-19 deaths in Vale do Ribeira.





DISCUSSION

This study is the only one carried out in Vale do Ribeira since the notification of the first case of COVID-19 in the region in April 2020. The results of this epidemiological investigation indicate an increasing trend in the notification of new cases, with greater involvement in females, aged between 20 and 59 years old, with preexisting diseases, in the municipalities

with the highest population density. Regarding deaths, there is a higher lethality rate in males, aged over 60 years old, with a history of kidney disease, liver disease, pneumopathy, neurological disease, heart disease and diabetes. In addition, demographic density was associated with the number of confirmed cases and deaths, revealing that the higher the demographic density, the greater the number of cases and deaths.

The greater prevalence of confirmed cases in females is like the profile identified in Maranhão,[10] Mato Grosso,[11] Piauí[12] and São Paulo.[9] However, it opposes the characteristic observed in studies carried out in Wuhan in China, in which the male sex was more affected by COVID-19.[4,13] On the other hand, it is also described in the literature that there is no significant difference in the comparison of sex between those infected.[14]

The municipalities of Registro and Cajati are characterized by the highest demographic densities in the Vale do Ribeira, respectively 75.11 Inh/km^2 (population estimated at 56,322) and 62.43 Inh/km^2 (population estimated at 28,549 inhabitants), as well as are the municipalities with the highest number of cases and deaths in the region. At the other extreme, the municipality of Iporanga has an estimated population of 4,218 inhabitants, a population density of 3.73 Inh/km^2 and only 27 cases of COVID-19 confirmed so far. The spread of the novel coronavirus is facilitated in cities with high population density, where social distancing is more difficult to be adopted and respected, as identified in the explosion of cases in Fortaleza, Ceará.[15]

However, a study that evaluated worldwide differences in mortality from COVID-19, did not identify an association between demographic density and mortality from the disease.[16] In addition, a study in New York, the epicenter of the disease in the United States, evaluated the rates of hospitalization and deaths from COVID-19 in the Bronx, Brooklyn, Manhattan, Queens and Staten Island neighborhoods, indicating that isolated population density is not a factor determinant for the number of deaths, which may be more associated with the underlying comorbidities, poverty, less education and structural inequalities.[17] In this context, the association between demographic density and the number of deaths in Vale do Ribeira may have as a probable cause the characteristic vulnerability of this region.

It is important to note that, in global emergency situations, it is vital to establish a quick, cheap, sensitive and effective diagnosis of people with the virus, asymptomatic or with clinical signs of the disease. This strategy tends to allow adequate management of the problem, with less impact on public health and the economy in general. However, underreporting of cases, specifically of people infected with SARS-CoV-2 and asymptomatic, can mask the actual number of people affected, underestimating the impact of the disease. The actual numbers of confirmed cases of COVID-19 and infected people are unknown, as large-scale population tests have not been carried out effectively by most countries.[18]

Regarding deaths, it is observed that in the Vale do Ribeira, COVID-19 had the highest number of fatalities in males, a situation similar to Piauí,[12] Maranhão,[10] Itália[19] and China.[20] Data on deaths due to COVID-19 in Brazil also point to a higher prevalence in males, corroborating the characteristics found in Vale do Ribeira.[7] The high number of deaths in the elderly may be related to the difficulty in the immune response of T and B lymphocytes and to the increase in cytokine production in the face of the inflammatory response,[21] raising death rates in this age group. Furthermore, chronic non-communicable diseases increase the chances of clinical complications and place this group of people in a more vulnerable condition.[22]

The confirmed cases of COVID-19 present different patterns in relation to sex in different regions of Brazil and the world.[4,13] However, they share as a common characteristic the greater involvement of economically active groups, in the age group between 30 and 39 years old.[23] Previous chronic diseases were

verified in a large proportion in this study and, together with the age group variable, it seems to be a determining factor in the number of deaths, with a higher lethality rate in males, aged ≥ 60 years old, with preexisting diseases, specifically heart diseases , diabetes, chronic respiratory diseases or hypertension.[12,23]

Until the data collection of this study, the lethality rate of COVID-19 in the World was 3.6%, in Brazil 3.2%, in São Paulo 3.8% and in Vale do Ribeira 2.22%, being that in all these scenarios the fatality rate is higher among men, the elderly and those with preexisting diseases.[9] The lethality rate of COVID-19 is influenced by intrinsic and extrinsic factors. The first relates to individual characteristics, such as age, preexisting diseases and lifestyle habits,[24] while the second is linked to the availability of therapeutic resources, specifically hospital beds, trained health staff, mechanical ventilators and medications.[25] Therefore, the intrinsic and extrinsic factors of each region must be taken into account in the analysis of mortality rates and in strategic planning to mitigate the number of fatalities.

As it is a vulnerable region, with difficulties in accessing health services, as occurs in other regions of Brazil, understanding about the behavior of the novel coronavirus in the Vale do Ribeira can help in the development of strategies to contain the progress of COVID- 19 and, consequently, mitigate the impacts on the life of the local population. It should be noted that Primary Health Care, specifically the Family Health Strategy, must take the lead in combating the pandemic in the region, as it is the main public health service in this location.

Approximately 163 million Brazilians depend exclusively on the public health system, which, in a pandemic situation, and depending on the speed of spread of the SARS-CoV-2 virus, can be substantially compromised, due to the extra demands generated by COVID-19.[26] In order to avoid the collapse of the health system in a short period of time, there must be an increase in the number of beds and health professionals with competencies to carry out the care, or contain the spread of the virus.[27] It is important to recognize that the demands for hospitalization and use of ICU beds are multifactorial, influenced by factors such as age, general health status and the presence of preexisting diseases, for example.

In this context, the trend in the increase in the number of cases in Vale do Ribeira lights up a warning sign due to the risk of overload in the local health system. Therefore, reducing the transmission of the novel coronavirus is the priority challenge for municipal managers, with the goal of mitigating the need for intensive care in hospitals and consequently reducing the number of deaths among severe cases.[3]

Despite this, debasing inequalities arise and are reinforced with the period of the pandemic in Brazil, either due to difficulties or adequate availability in accessing health services, as derived from other health determinants and conditions. Furthermore, the Vale do Ribeira region is considered the poorest region in the State of São Paulo, with the worst indicators of Gross Domestic Product per capita, average income from formal employment, infant mortality and Human Development Index (HDI), considered average, being between 0.641 and 0.754, but below the state average of 0.773.[28] It is estimated that approximately 26% of the population live in rural areas, 8.0% live in extreme poverty and several population groups, such as quilombolas, family farmers and indigenous communities have conditions of high vulnerability.[29-30] In addition, part of the local economy is fostered by the movement of people between cities in the region, which in turn favors community transferability.

As a result, some scenarios are presented in this region, such as precarious home infrastructures and low income, exposing the poor and most vulnerable population to the risks of infection with the novel coronavirus, as occurs in peripheral regions with greater risks of contagion and the spread of respiratory infections.[31] In order to avoid the collapse of the health system and the increase in the number of deaths, social protection measures are needed for the

poorest, with income preservation policies so that it can allow this population to achieve adequate social isolation, advocated as the main prevention tool for this disease in this current social scenario.

This study should be evaluated with caution, as it is a research that involves the analysis of a peculiar population from a single region of Brazil, with specific economic and socio-cultural characteristics. Still, it presents as a limitation the constant dynamics in the number of cases of COVID-19. As important highlights of the study are the information subsidy on the trend of the number of cases and deaths in the evaluated region, the contribution to the analysis of the national profile of the disease and specifically the possibility for the planning of local actions to face the new pandemic. coronavirus from scientific foundations.

CONCLUSION

The analysis of the epidemiological profile of confirmed cases and deaths of COVID-19 in Vale do Ribeira presents characteristics like other regions of Brazil and the world, revealing a greater predominance in the number of cases among women, in the age group of 20 to 59 years old, with preexisting heart disease. On the other hand, the number of deaths was higher among men, aged over 60 years old, with a history of heart disease. The lethality rate in the region was 2.22%, being 2.7% among men and 1.7% among women. The lethality rate in the region was 2.22%, being 2.7% among men and 1.7% among women.

The characterization and monitoring of the epidemiological profile of COVID-19 cases and deaths provide subsidies for strategic planning to deal with the novel coronavirus pandemic. In this context, a careful analysis is necessary in relation to the biological, economic and social aspects related to the increase and control in the number of COVID-19 cases. In Vale do Ribeira, social distancing, testing for COVID-19 and hygiene actions must be planned and implemented according to the peculiar characteristics of each municipality, respecting the guidelines of national and international agencies.

In addition, factors linked to the number of available hospital beds, organization and preparation of primary care and demographic density, are determinant for success in reducing the number of cases and deaths associated with COVID-19. As it is a region of great vulnerability, the Vale do Ribeira, as well as other regions of Brazil and the world with similar characteristics, requires special attention to break the inequalities in access to health and economic services, which, in turn, would minimize medium and long term impacts on population health.

RESUMO

Introdução: Conhecer o perfil epidemiológico da COVID-19 pode auxiliar na tomada de decisão a fim de interromper a pandemia. Neste contexto, o objetivo deste estudo foi analisar o perfil epidemiológico dos casos de COVID-19 no Vale do Ribeira, SP, Brasil. **Delineamento**: Levantamento epidemiológico em banco de dados secundário sobre os casos de COVID-19 no Vale do Ribeira, até 15 de agosto de 2020. **Resultados**: Foram contabilizados 4.873 casos de COVID-19, dos quais 108 foram a óbito. Dentre os casos confirmados, predominou o sexo feminino, de 20 a 59 anos, com cardiopatia. Os óbitos ocorreram com maior frequência no sexo masculino, idade acima de 60 anos, com cardiopatia. A taxa de letalidade foi de 2,22% e constatou-se que quanto maior a densidade demográfica do município, maior o número de casos e óbitos. **Implicações**: A tendência crescente no número de novos casos e óbitos por COVID-19 no Vale do Ribeira acende um sinal de alerta para a necessidade em avaliar periodicamente o sucesso das medidas profiláticas adotadas na região. Portanto, a divulgação de dados epidemiológicos sobre a doença aliado às medidas preventivas devem ser reforçadas para evitar o colapso no sistema de saúde e na atividade econômica da região.

DESCRITORES

Pandemias; Infecções por Coronavirus; Epidemiologia; Vigilância em Saúde Pública.

RESUMEN

Introducción: Conocer el perfil epidemiológico de COVID-19 puede ayudar en la toma de decisiones para detener la pandemia. En este contexto, el objetivo de este estudio fue analizar el perfil epidemiológico de los casos de COVID-19 en Vale do Ribeira, SP, Brasil. **Delineación:** Encuesta epidemiológica en una base de datos secundaria sobre casos de COVID-19 en Vale do Ribeira, hasta el 15 de agosto de 2020. **Resultados:** se registraron 4.873 casos de COVID-19, de los cuales 108 fallecieron. Entre los casos confirmados, predominó el sexo femenino, de 20 a 59 años, con cardiopatía. Las muertes ocurrieron con mayor frecuencia en hombres, mayores de 60 años, con enfermedades cardíacas. La tasa de letalidad fue de 2.22% y se encontró que a mayor densidad demográfica del municipio, mayor número de casos y muertes. **Implicaciones:** La tendencia creciente en el número de nuevos casos y muertes por COVID-19 en el Valle de la Ribeira brinda una señal de alerta sobre la necesidad de evaluar periódicamente el éxito de las medidas profilácticas adoptadas en la región. Por ello, se debe reforzar la difusión de datos epidemiológicos sobre la enfermedad, combinada con medidas preventivas, para evitar el colapso del sistema de salud y la actividad económica de la región.

DESCRIPTORES

Pandemias; Infecciones por Coronavirus; Epidemiología; Vigilancia en Salud Pública.

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CONFLICTS OF INTEREST

There are no conflicts of interest to declare.