Deaths by COVID-19 in a hospital from a city from Legal Amazon region: what lessons could be learned?

Mortes por COVID-19 em um hospital de uma cidade da região da Amazônia Legal: que lições podem ser aprendidas?

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ABSTRACT

Objective: Describe the epidemiology of COVID-19 deaths within a hospital in the Amazon region in a period of 64 days, which corresponds to the growth curve of the COVID-19 first-wave pandemic in 2020. **Methods:** The data were obtained from medical records of 152 deaths registered for adults and elderly hospitalized. The data were also compared with the number of deaths in previous years during the same period studied to assess the impact of the pandemic on this hospital. The study also assesses the impact of intra-hospital transfers, accounting for the number of times patients who died performed transfers between sectors of the hospital. **Results:** During the period analyzed, there was an increase in deaths compared to the previous years. The majority of dead patients were male, aged between 34 and 96 years. The deaths were associated comorbidities such as arterial hypertension, diabetes mellitus, and kidney disease. The SARS-CoV-2 infection was confirmed in 91 cases. Among them, 15 individuals were admitted without conditions related to SARS-CoV-2 infection; they had a three-fold higher number of hospital transfers than those admitted with SARS-CoV-2 infection symptoms. Sixteen patients with SARS-CoV-2 infection developed respiratory symptoms just after hospitalization. The diagnostic exam for SARS-CoV-2 infection was performed on average 4 (± 6) days after the onset of symptoms and 6 (± 6) days after admission, and the average time from the onset of respiratory symptoms to death was 4 (± 6) days. **Conclusions:** These data suggest the high presence of hospital infection by SARS-CoV-2 in the Brazilian Amazon region, which may be related to the number of sectorial transfers, delay in confirming the diagnosis, and lack of management. We report a serious public health problem, as it demonstrates the fragility of healthcare institutions in the hospital environment.

Keywords: COVID-19, SARS-CoV-2, 2019 novel coronavirus Pandemic, Nosocomial infection, Amazon region.

RESUMO

Objetivo: Descrever a epidemiologia de mortes por COVID-19 em um hospital na região da Amazônia em um período de 64 dias, que corresponde à curva de crescimento da primeira onda da pandemia de COVID-19 em 2020. **Métodos:** Os dados foram obtidos de 152 óbitos registrados em prontuários de adultos e idosos hospitalizados. Os dados foram também comparados com o número de óbitos em anos anteriores, no mesmo período estudado, de forma a avaliar o impacto da pandemia neste hospital. O estudo também avalia o impacto das transferências intra-hospitalares, contabilizando o número de vezes que os pacientes que faleceram realizaram transferências entre setores do hospital. **Resultados:** No período analisado, houve aumento de óbitos em relação aos anos anteriores. A maioria dos pacientes mortos era do sexo masculino, com idade entre 34 e 96 anos. Os óbitos foram associados a comorbidades como hipertensão arterial, diabetes mellitus e doença renal. A infecção por SARS-CoV-2 foi confirmada em 91 casos. Entre eles, 15 indivíduos foram internados sem condições relacionadas à infecção por SARS-CoV-2; eles tiveram um número três vezes maior de transferências hospitalares do que aqueles admitidos com sintomas de infecção por SARS-CoV-2. Dezesseis pacientes com infecção por SARS-CoV-2 desenvolveram sintomas respiratórios logo após a hospitalização. O exame diagnóstico para infecção por SARS-CoV-2 foi realizado em média 4 (± 6) dias após o início dos sintomas e 6 (± 6) dias após a admissão, e o tempo médio do início dos sintomas respiratórios até o óbito foi de 4 (± 6) dias. **Conclusões:** Esses dados sugerem alta presença de infecção hospitalar por SARS-CoV-2 na região amazônica brasileira, o que pode estar relacionado ao número de transferências setoriais, demora na confirmação do diagnóstico e falta de manejo. Relatamos um grave problema de saúde pública, pois demonstra a fragilidade das instituições de saúde no ambiente hospitalar.

Palavras-Chave: COVID-19, SARS-CoV-2, Pandemia do novo coronavírus 2019, Infecção hospitalar, Amazônia.

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INTRODUCTION

In December 2019, the Chinese Center for Disease Control and Prevention identified several cases of pneumonia in Wuhan, a province in Hubei[1]. The etiologic agent was classified as SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2), and the infection was termed as coronavirus disease (COVID-19)[2]. In March 2020, there were already cases in more than 110 countries with approximately 4,000 confirmed deaths; then COVID-19 was declared a pandemic disease[3].

SARS-CoV-2 can be mainly transmitted through droplets, aerosols, and respiratory secretions that reach the respiratory tract. The vertical transmissions and the viral spread through surfaces are also possibilities [4,5]. The characteristic symptoms of COVID-19 include fever, malaise, dry cough, and dyspnea[1]. Most patients affected by this disease have mild manifestations; however, there are conditions that can increase the risk of complications, including age and comorbidities such as hypertension, diabetes mellitus, and cardiovascular and cerebrovascular diseases[6,7].

The first confirmed case of COVID-19 in Brazil occurred on February 26 (2020), and the virus rapidly sprayed to other states and regions[8]. For instance, it was first detected in the Legal Amazon in March 13[9]. The Maranhão state registered its first case on March 20, 2020. This case was detected in São Luis (the state capital)[10], and also the city from which the data were collected for this study.

In Brazil, notifications to the Ministry of Health of SARS-CoV-2 infections transmitted within Brazilian hospitals are mandatory since August 2020. Accordingly, it was observed 1162 SARS-CoV-2 infections due to nosocomial transmission in Brazil between August to December 2020. However, the outcome of these patients is not known. In addition, a large number of underreporting or reporting errors make it difficult the real understanding of the situation. Thus, it is important to understand the risk factors for this disease in specific conditions, such as those found in Legal Amazon.

The Legal Amazon is the area that encompasses states belonging to the Amazon basin (Acre, Amapá, Amazonas, Mato Grosso, Pará, Rondônia, Roraima, Tocantins, and parts of Maranhão) and shares the socio-demographic characteristic that could also interfere with the manifestations of the SARS-CoV-2[9,11].

In fact, some studies showed a special concern with the Amazon region since the strong presence of Amerindians among the population conferred an important immunological vulnerability to SARS-CoV-2[9]. Furthermore, a study indicated that comorbidities were more common in patients admitted to hospitals from Legal Amazon than those from the Central-South region[11].

São Luis city is an island with an ethnic constitution mostly represented by *Pardo* Brazilians (miscegenation between African and European descendants) and African Brazilians. The city also has Amerindian descendants, including those mixed with African descendants. In general, Pardo and African Brazilians have a significantly higher risk of mortality by COVID-19 than White Brazilians[11]. A population-based survey indicated a high seroprevalence of SARS-CoV-2 in Maranhão[10,12].

As part of Legal Amazon, this population has important issues related to COVID-19 due to their social vulnerability, immunological features, and other conditions that compromise the health[11,13,14].

In this context, this study aimed to describe the epidemiology of COVID-19 deaths within hospitals in the Amazon region in a period of 64 first days of the first wave pandemic curve of COVID-19 in 2020, long before the peak of the first wave of the pandemic[15]. We believe that this knowledge is important to develop new strategies to manage these cases in the other possible waves of COVID-19 and other emerging viral diseases.

METHODS

Study Design and Participants

This descriptive observational cross-sectional study evaluates the profile of deaths that occurred in a general hospital of medium complexity in São Luís. The largest audience is the elderly population, who receive clinical and surgical care; however, adults and children are also assisted. This hospital has 47 clinical beds, urgency and emergency sectors, clinical wards, wards for patients with COVID-19, surgical wards and general care, and ten intensive care units (ICU) for COVID-19 patients.

The analysis was conducted for 64 days (from March 22 to May 24, 2020) during the exponential

growth phase of the beginning of the first wave of COVID-19 cases. Only deaths registered for adults and elderly hospitalized during this period were analyzed.

The sample comprised 152 deceased patients (86 men and 66 women) with clinical and surgical pathologies aged between 34 and 96 years. The data were also compared with the number of deaths in the years 2016, 2017, 2018, and 2019, during the same period studied, in order to assess the impact of the pandemic on this hospital. The study also assesses the impact of intra-hospital transfers, accounting for the number of times patients who died performed transfers between sectors of the hospital.

Data Collection and Variables

Data collection took place by recording medical records by trained health professionals, and later a spreadsheet was prepared with the database, and the data were evaluated.

The variables investigated in this study were age, sex, date of admission to the hospital, date of onset of symptoms, date of death, date of examination, and the existence of comorbidities.

It is important to note that these data were selected because they represent an increase in the incidence of deaths in this hospital and this registration was performed shortly after confirmation by the Health Surveillance of the State of Maranhão in the first case of COVID-19 in the state that was on 20 March 2020.

Statistical Analysis

The data were analyzed using descriptive statistics with measures of trend and measures of dispersion using the Bioestat 5.3 program. In all cases, a 95% certainty was considered.

Ethical Approval

Ethical approval was obtained from the Research Ethics Committee of Ceuma University (CEP) in compliance with the requirements of Resolution 466/2012 of the National Health Council that guides research involving human beings, directly or indirectly. The project was approved with CEP Opinion No. 4.315.245.

RESULTS

The data collected within two months of the pandemic revealed that 152 patients died in a period of 62 days (86 men and 66 women). These patients aged between 34 and 96 years (mean age, 71 ±12 years). The majority (78/152) of these individuals were aged between 61 and 80 years, 41 were over 80 years old, and 25 were between 50 and 60 years old. Only seven patients were aged under 50 years, while one subject had no information on age (Figure 1). During the period of the study, a total of 1083 deaths from SARS-CoV-2 infection were recorded in Maranhão state[12]. Another important observation is the increase of deaths in the hospital studied when compared with the same period in the previous four years: 61 (2016), 55 (2017), 44 (2018), and 60 (2019) (Figure 2).

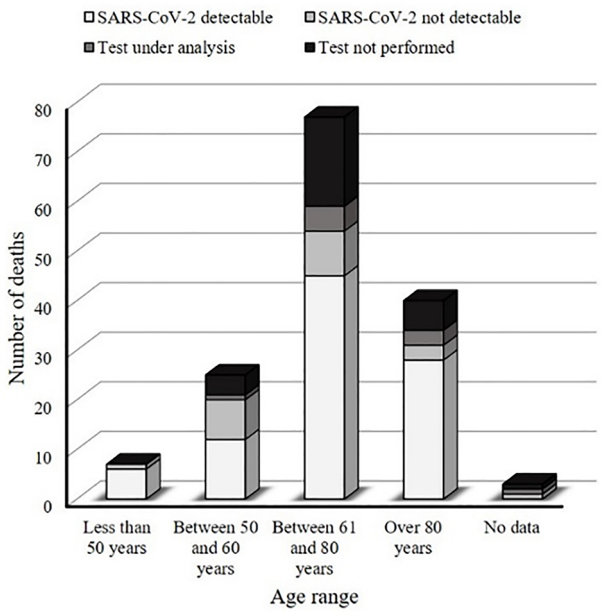


Figure 1. The age range of the sample of deaths observed between March 22 and May 24, 2020, in a hospital in the Brazilian Legal Amazon region. This figure shows the performance of diagnostic tests, with the majority of cases being performed serology or polymerase chain reaction in different age groups.

Among these 152 deaths, SARS-CoV-2 infection was confirmed in 91 cases. The diagnosis of COVID-19 was performed by RT-qPCR (77 cases) and serology (14 cases) (Figure 2). The analysis of symptoms of COVID-19 positive patients revealed that 51 presented symptoms related to SARS-

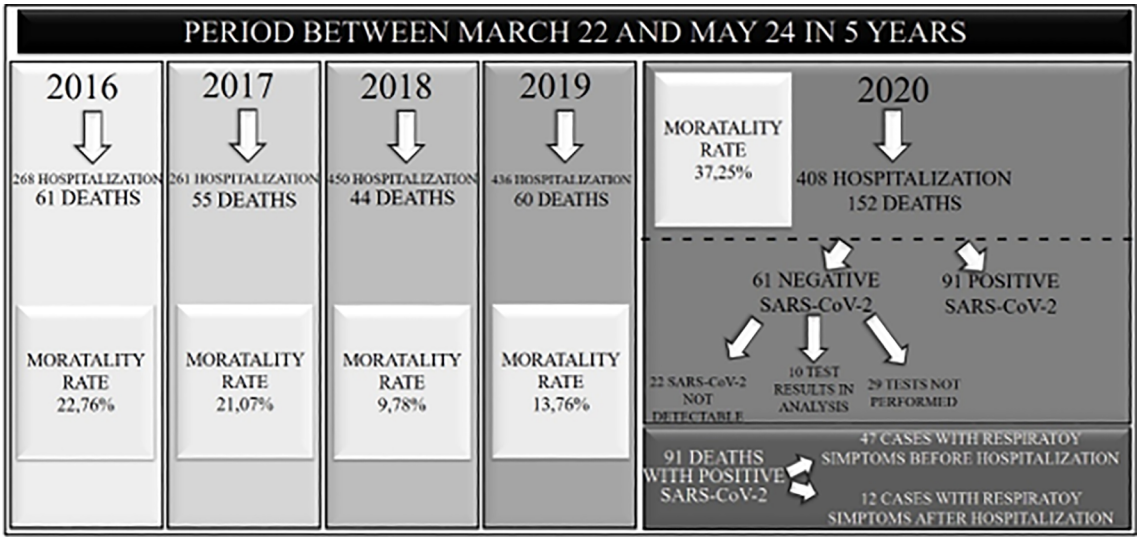


Figure 2. Number of deaths from 22nd March to 24th May in 2016, 2017, 2018, 2019, and 2020. In 2020, SARS-CoV-2 infection confirmations are detailed.

CoV-2 infection, 15 had symptoms not related to SARS-CoV-2 infection, and 25 had no register of symptoms. In relation to those without confirmation of SARS-CoV-2 infection (32/152), 12 showed symptoms related to SARS-CoV-2 infection, three had symptoms not related to SARS-CoV-2 infection, and 17 had no register of symptoms. The tests for diagnosis of COVID-19 were not performed on 29 individuals that did not show any symptoms related to this disease (Table 1). Another important piece of information, 12 confirmed cases present symptoms after a month in the hospital.

Among the 22 patients who had undetectable SARS-CoV-2, 11 were hospitalized for respiratory symptoms and signs of the flu-like syndrome. Fifty-one among the ninety-one patients with SARS-CoV-2 infection detectable on examination were admitted with symptoms of COVID-19; however, only four had already been admitted to the hospital and had been placed in isolation (Table 1).

We highlighted the case of a male patient outside the risk group for not having comorbidities and being 34 years old, but who died nine days after developing respiratory symptoms due to COVID-19, although he was hospitalized 16 days earlier for partial colectomy.

The confirmed cases of SARS-CoV-2 infection were more frequent in men (50/91) than in women (41/91). The age ranged from 34 to 96 years (mean age, 71 ± 12 years). In this group, only four were hospitalized for suspected SARS-CoV-2 infection, 40 for situations related to respiratory distress and dyspnea, seven for cough or other symptoms of SARS-CoV-2 infection, and 15 for conditions

Table 1
Frequencies between symptoms related to SARS-CoV-2 infection and results of the test performed to detect the virus of patients who died from March 22 to May 24, 2020, in a hospital in the Brazilian Amazon region.

Test result	*Detectable Sars-CoV-2 n / %*	*Not detectable Sars-CoV-2 n / %*	*Under analysis n / %*	*Without registern n/ %*	*Total*
Symptoms related to Sars-CoV-2	51 / 81	10 / 16	2 / 3	0 / 0	63 / 100
Symptoms not related to Sars-CoV-2	15 / 75	2 / 10	1 / 5	2 / 10	20 / 100
Without register of symptoms	25 / 36	10 / 15%	7 / 10	27 / 39	69 / 100
Total	91 / 60	22 / 14	10 / 7	29 / 19	152 / 100

or symptoms unrelated to SARS-CoV-2 infection. Twenty-five patients had no related data.

Among the 91 cases positive for SARS-CoV-2 infection, eight patients did not present comorbidities, and no report was found for 29 individuals. The remaining registered cases (n = 54) presented different types of comorbidities: 17 had only one comorbidity; 21 had two comorbidities; and 16 had three or more comorbidities (Figure 3). The following comorbidities were observed: arterial hypertension, diabetes mellitus, kidney disease, stroke, vascular disease, liver and/or biliary diseases, dyslipidemia and/or obesity, hypothyroidism, heart disease, neurological disease, cancer, chronic alcoholism, and arthritis (Figure 3).

Following, we evaluated the number of sector transfers in the hospital among the patients with suspicion or symptoms related to SARS-CoV-2 infection ranging from zero to four. Approximately half of these individuals had only one sector transfer. Inpatients without symptoms related to SARS-CoV-2 infection had zero to six sector transfers, with more than half of them having two transfers. The 22 patients who were negative for SARS-CoV-2 infection had zero to two sector transfers (Table 2).

The examination was performed from 31 days before to 49 days after admission (on average, four days after admission, w ith a standard deviation of 11 days) and from 27 days before to 23 days after the onset of respiratory symptoms (on average, four days after respiratory symptom onset, with a standard deviation of 6 days) (Table 1).

The time between the onset of respiratory symptoms and the hospitalization was calculated, 32 cases have not been reported on these dates, 47 cases presented respiratory symptoms before or on the date of hospitalization, and, 12 cases presented respiratory symptoms after these dates (Figure 4). The time of onset of respiratory symptoms in these patients ranged from 14 days before to 41 days after admission (on average, admission occurred on the day of symptom onset, with a standard deviation of 11 days before admission) (Table 1). Twelve out of these seven cases had onset respiratory symptoms from two to 41 days after the hospitalization (on average 11 days with a standard deviation of ten days after admission) (Figure 4A).

The cause of hospitalization of each one of the 12 cases that had respiratory symptoms after hospitalization was: bullous erysipelas; renal insufficiency; bloodstream infection; observation due to weakness; urinary infection; vascular foot surgery; partial colectomy; abdominal pain, inappetence and fever; sepsis due to diabetic polyneuropathy; inappetence and dysphagia; diarrhea and emesis; left hemiplegia and aphasia (Figure 4B).

The following information about the epidemiological process of SAR-CoV-2 infection in this study is highlighted: the time from examination

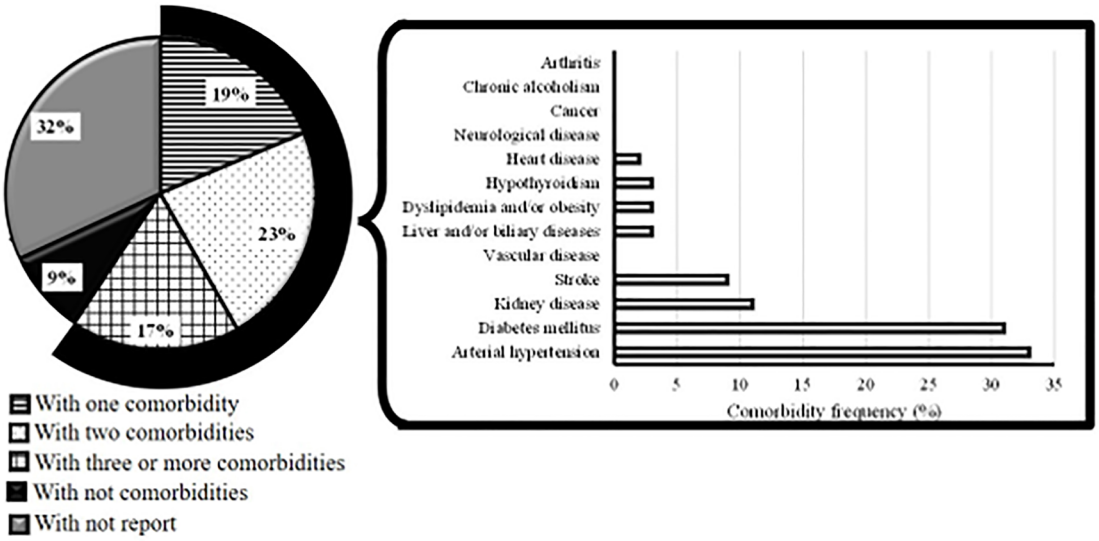


Figure 3. Description of comorbidities in studied SARS-CoV-2 infection patients.

Table 2
Number of transfers between patients who died from March 22 to May 24, 2020, in a hospital in the Brazilian Amazon region, organized by confirmation of SARS-CoV-2 and hospitalization symptoms COVID-19, coronavirus disease; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

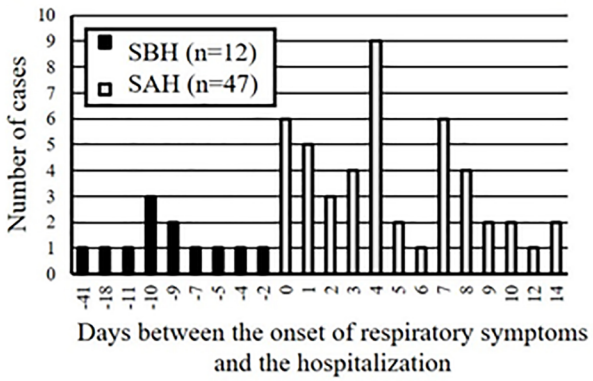
Number of transfers	**None**	**1**	**2**	**3**	**4**	**5**	**6**	**No data**	**Total**
SARS-CoV-2 detectable (inpatient with symptoms of COVID-19)	6	23	20	2	1	0	0	0	52
SARS-CoV-2 detectable (inpatient without symptoms of COVID-19)	0	3	5	3	1	1	1	0	14
SARS-CoV-2 detectable (patient without symptom information)	0	0	0	0	0	0	0	25	25
SARS-CoV-2 not detectable (inpatient with symptoms of COVID-19)	0	6	3	0	0	0	0	1	10
SARS-CoV-2 not detectable (inpatient without symptoms of COVID-19)	0	1	1	0	0	0	0	0	2
SARS-CoV-2 not detectable (patient without symptom information)	0	0	0	0	0	0	0	10	10
Test under analysis (inpatient with symptoms of COVID-19)	0	2	0	0	0	0	0	0	2
Test under analysis (inpatient without symptoms of COVID-19)	0	1	0	0	0	0	0	0	1
Test under analysis (patient without symptom information)	0	0	0	0	0	0	0	7	7
Test not performed (inpatient with symptoms of COVID-19)	0	0	0	0	0	0	0	0	0
Test not performed (inpatient without symptoms of COVID-19)	0	0	1	1	0	0	0	0	2
Test not performed (patient without symptom information)	0	0	0	0	0	0	0	27	27
Total	6	36	30	6	2	1	1	70	152

to death ranged from 0 to 32 days (on average, six days, with a standard deviation of six days). The time from the onset of respiratory symptoms to death ranged from 0 to 31 days (on average, four days, with a standard deviation of six days) (Table 1, Figure 5, Supplemental Table 1 and Supplemental Table 2).

Considering the data, it is important to note that all patients confirmed to have SARS-CoV-2 infection who died were already admitted to the hospital. Except for the four patients who were placed in isolation at the very beginning of hospitalization because they were suspected of SARS-CoV-2 infection, at least 15 were hospitalized with symptoms unrelated to SARS-CoV-2 infection. The data on the onset of respiratory symptoms in 12 patients suggest that they may have developed SARS-CoV-2 infection in the hospital environment; this may have been an important factor associated with the death of these patients.

The fact that most patients were not isolated at the time of hospitalization because they have mild symptoms or because they do not have the disease may have been an important exposure factor for both

A



B

DAYS	CAUSE OF HOSPITALIZATION
-41	Bullous erysipelas
-18	Renal insufficiency
-11	Bloodstream infection
-10	Observation due to weakness
-10	Urinary infection
-10	Vascular foot surgery
-9	Partial colectomy
-9	Abdominal pain, inappetence and fever
-7	Sepsis due to diabetic polyneuropathy
-5	Inappetence and dysphagia
-4	Diarrheia and emesis
-2	Left hemiplegia and aphasia.

Figure 4. Time between the onset of respiratory symptoms and the hospitalization. A. Frequency distribution of days between the onset of respiratory symptoms and the hospitalization. B. Box with the cause of hospitalization to each one that presents respiratory symptoms after hospitalization. The calculus was performed by subtracting the date of hospitalization from the onset of respiratory symptoms. The positive value was found when the onset of respiratory symptoms occurred before hospitalization (SBH). The negative value was found when the respiratory symptoms occurred after hospitalization (SAH).

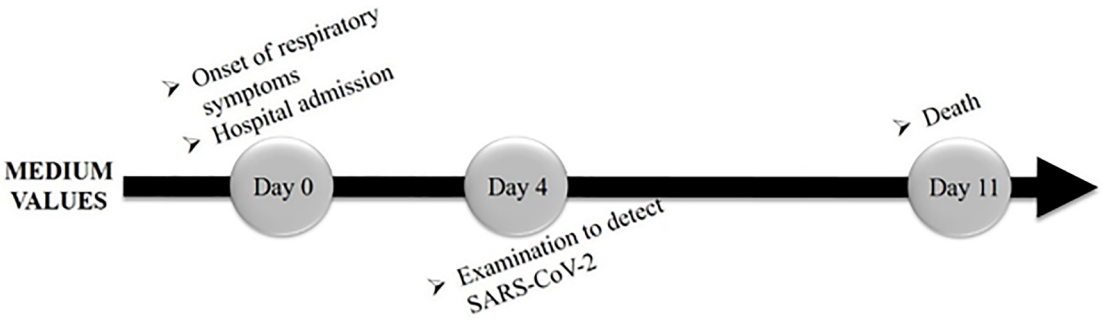


Figure 5. Timeline with important information on the confirmed deaths of SARS-CoV-2 infection. The days shown are the average values of the data studies.

patients who have already entered the hospital and those who acquired the infection in the hospital itself.

This observation can be made when we analyze that patients who entered the hospital without severe respiratory symptoms underwent twice as many transfers as patients with more severe symptoms, which may have aggravated their clinical condition or even promoted the occurrence of the disease.

DISCUSSION

During the studied period, it was observed a significant increase in the number of deaths among inpatients from this hospital. The deaths observed among inpatients occurred mainly in male individuals over 60 years old and with comorbidities. These data are in agreement with previous findings indicating a higher incidence of deaths in elderly patients and presenting comorbidities, such as hypertension, cardiovascular diseases, respiratory diseases, high HDL levels, and multiple organ dysfunction, which can complicate the prognosis of the manifestation of COVID-19[16,17].

At the beginning of the SARS-CoV-2 Infection pandemic in Brazil, the Ministry of Health stated that a patient with suspected SARS-CoV-2 Infection should seek health care just if they had respiratory symptoms[18]. In this way, it was normal hospitalizations for SARS-CoV-2 infection only occur after the onset of symptoms, and this was what happened in our study with the vast majority of confirmed cases

for this infection[19]. However, there were cases of individuals admitted that had neither respiratory nor other symptoms of SAR-CoV-2 infection. These cases were admitted because of other diagnoses and showed SARS-CoV-2 infection symptoms after a time longer than the average incubation period of the disease.

In addition, it was possible to observe that not all patients who presented respiratory symptoms and signs of the flu-like syndrome were properly placed in isolation at the beginning of the transmission, which may have facilitated the transmission of SARS-CoV-2 within the hospital. So, our study suggests the occurrence of 13,18% of deaths associated with nosocomial infection induced by SARS-CoV-2.

These findings corroborate with other studies that indicate hospitalization as a risk factor for COVID-19, with the potential to worsen the patient's clinical condition and lead to death. For instance, in a study conducted in London, 45 (6.8%) of 662 inpatients diagnosed with COVID-19 probably acquired this disease in the hospital[20]. Similar results were found for patients from three university hospitals in France, where the percentage of nosocomial infection caused by SARS-CoV-2 was 4.9% (15/301)[21]. In a university hospital in Brazil, the percentage of nosocomial infection caused by SARS-CoV-2 was 8.6% (185/2146). It is important to highlight that our study focused only on death cases, evidencing the relevance of our findings. Moreover, considering that the same condition found in the evaluated hospital is similar to the others from Brazil[22].

The indications for performing respiratory isolation methods at the time of the study, according to the protocols of the Ministry of Health of Brazil for inpatients with COVID-19 symptoms, include the flu syndrome, as manifested by fever, cough, sore throat, coryza, and difficulty breathing, and severe acute respiratory syndrome (SARS). SARS is characterized by dyspnea/respiratory discomfort or persistent pressure in the chest or oxygen saturation below 95% in room air or bluish color of the lips or face[18].

In many cases described in this study, diagnostic tests for SARS-CoV-2 infection were not performed even though they had suggestive clinical manifestations, probably owing to the high demand for tests and low availability of diagnostic tests at the time of the study. In other situations, some patients had symptoms such as myalgia, fatigue, anorexia, confusion, dizziness, headache, hemoptysis, diarrhea, nausea/vomiting, abdominal pain, conjunctival congestion, and sudden anosmia or hyposmia, and the COVID-19 test was not performed, as instructed by the Ministry of Health of Brazil[18].

Although the Guidelines for Diagnosis and Treatment for COVID-19 from the Ministry of Health of Brazil[18] justify the fact that tests for COVID-19 are only performed after the appearance of respiratory symptoms, this procedure may have represented a delay in the diagnosis and assessment of the prognosis of patients, while exposing other patients who are in the hospital environment for other reasons. This makes the situation quite serious, as SARS-CoV-2 infection can be an important risk factor in the hospital environment for inpatients with other health problems[22].

A study conducted in a Singapore hospital describes the importance of an infection control package to minimize environmental contamination in hospital wards among patients and healthcare professionals; this shows that there is a need for bed management in a hospital owing to the impact of patient transfers between wards on illnesses[23].

SARS-CoV-2 has been detected in hospital isolation wards, air conditioning filters, and air samples in the wards of a studied hospital[24], demonstrating that the virus can be transmitted directly through respiratory droplets or indirectly through fomites in a hospital. It is evident that movement and transfers in wards increase the possibility and risk of SARS-CoV-2 infection.

The results obtained here indicate the importance of managing inter-hospital infections during this pandemic and understanding that hospitalized patients are more susceptible than if they were healthy, which could increase the likelihood of contagion and death. These data corroborate the literature that describes that SARS-CoV-2 infection can complicate the perioperative course, representing a diagnostic challenge and presenting a high potential mortality rate[25].

In addition, it is known that, in general, nosocomial infections are responsible for the increase in morbidity and mortality of patients admitted to the ICU[26]. The World Health Organization has issued guidance specifically aimed at the clinical management of patients suspected of being infected

with SARS-CoV-2 to prevent the occurrence of nosocomial infection and as one of the measures to control the pandemic[27].

We observed that, in general, patients with confirmed SARS-CoV-2 infection who died were hospitalized on the day of onset of respiratory symptoms, and the test was performed on an average of four days thereafter. The average time between the onset of respiratory symptoms and death was 11 days. These data reveal respiratory symptoms as crucial to the occurrence of events, and this is possibly attributed to the indication of the Ministry of Health that patients should only seek healthcare or undergo a diagnostic examination for SARS-CoV-2 infection in case of severe respiratory symptoms[18]. This indication caused the prognosis of many patients to worsen, making therapy difficult and increasing the time that such patients spread the disease. After the examination, the patients studied had a four-day survival on average.

Our results suggest as conduct that the tests to detect SARS-CoV-2 should be performed as fast as possible to start the therapy early since the first adopted protocol by the Ministry of Health of Brazil[18] may have been responsible for the delay in treatment, the spread of the disease, and death of people[13,28]. It is important to avoid bed transfers of patients, even for those without symptoms, due to the risk of nosocomial infections through different sources[23,24]. It is also indispensable the attention to all age groups, and not just to the elderly. This research observed that all deaths in patients under 50 years old were associated with SARS-CoV-2 infection.

A new pandemic wave of COVID-19 was recognized in October, 2020, showing a peculiar feature: the mean age of infected/hospitalized individuals is lower[29]. One current hypothesis is that older individuals are less exposed at this time. On the other hand, we observe the emergence of new variants of SARS-CoV-2 that can be more aggressive to younger groups, including children[30]. Thus, it is necessary a new position about the management of inpatients in the other possible waves.

This study presents some incomplete data; these gaps happened because either the health service did not have sufficient tests for cases or due to the excessive demand. In this sense, the health team did not register all the important information in the protocols. However, these data are still relevant because they describe a series of occurrences that are involved in the high number of deaths in an Amazonian locality.

Coming from the critical situations indicated by this work, one important change has been observed in the second wave: the laboratory test has become more frequent at the beginning of the symptoms. Unfortunately, the other situations have not changed. We suggest, therefore, that all the measures indicated may be the target of hospital management during the pandemic.

CONCLUSION

We concluded that it was observed an increase in the number of deaths, which were mostly related to COVID-19. In addition, the data suggest that the inpatients were vulnerable to this infection within the hospital environment, which increased the incidence of deaths. This contamination may be related to the number of transfers from sectors through which these infected patients are placed, exposing patients to other morbidities. The local issues in the Amazon region and public policies adopted at the beginning of the pandemic may be connected with some of the approaches that we suggest have a relationship with an increase in SARS-CoV-2 infections.

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