Clinical profile and outcomes of hospitalized patients in a Covid-19 referral center in Rio de Janeiro

Perfil clínico e desfecho de pacientes hospitalizados em um centro de referência para Covid-19 no Rio de Janeiro

Perfil clínico y evolución de pacientes hospitalizados en un centro de referencia de Covid-19 en Río de Janeiro

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ABSTRACT

Objective: To assess the profile of patients hospitalized in a public Covid-19 referral center in Rio de Janeiro. **Methods:** An observational, cross-sectional, retrospective study was conducted at a public hospital during April 2021. 1413 patients with suspected Covid-19 were included in the study and data were collected from electronic medical records. **Results:** There was a predominance of older patients (59.12 years of age ± 13.79; mean ± SD) being hospitalized, with no significant male/female difference and the majority of patients came from emergency units. 44.09% of patients occupied intensive care beds. Out of those, 74.52% reported dyspnea, 49.68% had more than 50% pulmonary involvement and the most present chest CT finding was ground-glass opacity. 84.27% had some type of comorbidity and systemic arterial hypertension was the most reported one. The median time elapsed from the onset of symptoms to hospital admission was 8 days (IQR 6-11). **Conclusion:** Most of those hospitalized with Covid-19 in the analyzed period were elderly, of both sexes. The delay between the onset of symptoms and hospitalization, severe pulmonary involvement and the presence of comorbidities were identified in the records of patients with severe evolution.

Keywords: COVID-19, SARS-CoV-2, Severe acute respiratory syndrome.

RESUMO

Objetivo: Avaliar o perfil dos pacientes internados em um centro de referência para Covid-19 no Rio de Janeiro. **Métodos:** Um estudo observacional, transversal e retrospectivo foi realizado em um hospital público em abril de 2021. 1.413 pacientes com suspeita de Covid-19 foram incluídos no estudo e os dados foram coletados em prontuários eletrônicos. **Resultados:** Houve predomínio de pacientes mais velhos (59,12 anos ± 13,79; média ± DP) internados, sem diferença significativa entre homens/mulheres e a maioria dos pacientes veio de unidades de emergência. 44,09% dos pacientes ocupavam leitos de terapia intensiva. Destes, 74,52% relataram dispneia, 49,68% tinham mais de 50% de envolvimento pulmonar e o achado de TC de tórax mais presente foi a opacidade em vidro fosco. 84,27% apresentavam algum tipo de comorbidade e a hipertensão arterial sistêmica foi a mais relatada. A mediana do tempo decorrido desde o início dos sintomas até a admissão hospitalar foi de 8 dias (IQR 6-11). **Conclusão:** A maior parte dos hospitalizados com Covid-19 no período analisado foram idosos, de ambos os sexos. A demora entre o início dos sintomas e a hospitalização, um acometimento pulmonar severo e a presença de comorbidades foram identificados nos registros dos pacientes com evolução grave.

Palavras-chave: COVID-19, SARS-CoV-2, Síndrome respiratória aguda grave.

RESUMEN

Objetivo: Evaluar el perfil de los pacientes ingresados en un centro de referencia por Covid-19 en Río de Janeiro. **Métodos:** Se realizó un estudio observacional, transversal y retrospectivo en un hospital público en

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abril de 2021. Se incluyeron en el estudio 1.413 pacientes con sospecha de Covid-19 y los datos se recolectaron de historias clínicas electrónicas. **Resultados:** Predominaron los pacientes de mayor edad (59,12 años ± 13,79; media ± DE) hospitalizados, sin diferencia significativa entre hombres/mujeres y la mayoría de los pacientes provenían de unidades de emergencia. El 44,09% de los pacientes ocuparon camas de cuidados intensivos. De estos, el 74,52% informó disnea, el 49,68% tenía más del 50% de compromiso pulmonar y el hallazgo más común en la TC de tórax fue la opacidad en vidrio deslustrado. El 84,27% presentaba algún tipo de comorbilidad y la hipertensión arterial sistémica fue la más reportada. La mediana de tiempo transcurrido desde el inicio de los síntomas hasta el ingreso hospitalario fue de 8 días (RIC 6-11). **Conclusión:** La mayoría de los hospitalizados con Covid-19 en el período analizado eran adultos mayores, de ambos sexos. La demora entre el inicio de los síntomas y la hospitalización, el compromiso pulmonar severo y la presencia de comorbilidades fueron identificados en los prontuarios de los pacientes con evolución severa.

Palabras clave: COVID-19, SARS-CoV-2, Síndrome respiratorio agudo severo.

INTRODUCTION

In December 2019, a new coronavirus was identified in patients with pneumonia in Wuhan, China The disease presented itself as a severe acute respiratory syndrome of rapid evolution and high transmissibility, which resulted in the emergence of a global pandemic (HUANG C, et al., 2020).

The novel coronavirus named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is part of the *Coronaviridae* family which comprises enveloped positive-strand RNA viruses that infect vertebrates (GOBALENYA AE, et al., 2020). In humans, SARS-CoV-2 infects nasal and bronchial epithelial cells and pneumocytes, and, as the infection progresses, pulmonary capillary endothelial cells are also damaged (WIERSINGA WJ, et al., 2020).

Although Chinese data from the beginning of the pandemic show a similar distribution between men and women, other studies indicate that male patients are more affected than females (ZHANG JJ, et al., 2020; WIERSINGA WJ, et al., 2020). SARS-CoV-2 is mainly transmitted via respiratory droplets from face-to-face contact during coughing, talking, or sneezing, but can also occur through contaminated surfaces (WIERSINGA WJ, et al., 2020).

During the clinical investigation, Covid-19 diagnosis is usually made by polymerase chain reaction testing (RT-PCR) of a nasopharyngeal swab. However, clinical, laboratory and imaging data play an important role in the diagnosis of false-negative patients. The most reported symptoms are fever, cough, and dyspnea (ZHENG Z, et al., 2020). Laboratory abnormalities usually include lymphopenia, elevated serum C-reactive protein, lactate dehydrogenase, alanine aminotransferase, aspartate aminotransferase, and low albumin (WIERSINGA WJ, et al., 2020).

Chest computed tomography typically shows ground-glass opacities, interlobular septal thickening, and consolidation (SONG F, et al., 2020). Therefore, the combination of these features allows doctors to establish an early diagnosis and management of the patient even with a negative RT-PCR result. Disease progression can lead to complications such as heart dysfunction, hemodynamic instability, venous and arterial thromboembolic events, and brain damage (WIERSINGA WJ, et al., 2020).

To date, according to the World Health Organization, Covid-19 has affected 612 million people worldwide, bringing important challenges in the field of research, assistance, and health management (WHO, 2022). In Brazil, more than 30 million cases of SARS-CoV-2 infection have been confirmed and 685,000 deaths have been reported (WHO, 2022). Rio de Janeiro is one of the most affected state capitals, as it is a populous, and tourist center (CIEVS/SES-RJ, 2021; LIMA SS, et al., 2021).

Health research is essential for planning public health policies, especially when it provides data comprising a large number of patients. The Covid-19 pandemic has devastated the world and required rapid organization of health systems. Therefore, an in-depth analysis of the data from this period can contribute to improving not only our public health system but others worldwide to overcome obstacles and develop a fast response during

future health crises. Studies on Covid-19 also contribute to reinforcing the importance of government prevention actions. Encouraging vaccination and investing in the qualification of health professionals are some of the actions capable of reducing unfavorable outcomes of this disease (SOUZA-SILVA MVR, et al., 2022).

This study was conducted at a secondary hospital of the Brazilian Unified Health System (SUS), which originally operated as a general hospital. As of March 2020, it became a Covid-19-exclusive hospital, reaching its maximum number of beds in the infirmary and intensive care whenever the number of SARS-CoV-2 cases raised in Rio de Janeiro. Thus, it is paramount to analyze the hospitalized patients in this large referral hospital to contribute to the understanding of factors related to unfavorable outcomes of this disease and to public health planning. This study aims to assess the demographic profile, comorbidities, clinical and radiological presentation, and clinical outcome of Covid-19 suspected patients during the month with the highest number of admissions in the hospital. Also, it provides data regarding the flow of referrals between public health facilities, which helps to outline the strengths and weaknesses of our public health system in a catastrophic scenario.

METHODS

An observational, cross-sectional, and retrospective study was conducted at a public hospital in Rio de Janeiro, and data were collected from the institution's electronic medical record, TIMed. It is a secondary SUS hospital that, before the start of the pandemic, had maternity, neonatal, and adult intensive care, medical clinic, surgery, mental health, and specialty outpatient services. From March 2020 to the end of 2021, the hospital dedicated itself exclusively to the treatment of patients with Covid-19. In this period, there was a considerable increase in the number of beds, reaching a total of 420 beds at the beginning of 2021. April 2021 was the month with the highest number of Covid-19 admissions at the hospital to date.

For an overall assessment of admissions, all patients with a history of respiratory symptoms admitted to this institution between 04/01/2021 and 04/30/2021 aged 18 years or over were included. The variables analyzed were sex, age, origin (health unit of origin), type of bed occupied at the end of hospitalization (infirmary or intensive care), length of hospital stay, and clinical outcome (discharge, transfer, or death). These variables made it possible to trace the demographic profile of the admitted patients, including the type of health unit from which patients are referred, which is relevant in the context of the SUS structure.

Thus, it was possible to identify whether the patient came from an emergency unit (emergency care unit, regional emergency coordination, emergency medical care, or hospital) or primary care (family clinic or municipal health center). In general, the traditional flow of referrals to hospitals is done from emergency units. However, given the severity of the Covid-19 evolution, direct referral of primary care to this institution became an acceptable practice, to meet the growing demands for hospital beds. Depending on the unit of origin, the type of bed occupied, and the clinical outcome, it is possible to discuss the accessibility of the SUS, the severity of the presentation, and the evolution of the disease.

For the specific assessment of intensive care patients, all patients with a history of respiratory symptoms admitted between 04/01/2021 and 04/30/2021 aged 18 years or over were included. Patients who occupied infirmary beds right before death, discharge, transfer, or evasion were excluded from the sample, those who did not have complete information, those who were not hospitalized, and those whose diagnosis of Covid-19 was discarded based on clinical evolution and computed tomography (CT) findings. The variables analyzed were: time elapsed from the onset of symptoms to hospitalization, symptoms, CT findings on admission, and comorbidities. Therefore, it is possible to have a detailed view of the profile of patients with Covid-19 who had a more severe evolution and occupied intensive care beds.

Data were analyzed using the GraphPad Prism 6 program. From the quantitative variables, the mean and standard deviation or median and interquartile range were calculated, depending on whether the distribution was normal or non-normal, respectively. D'Agostino-Pearson was the normality test used. For the analysis of qualitative variables, analyzes of relative frequency (percentage) were performed.

The study was approved by the Research Ethics Committee of the Municipal Health Department of Rio de Janeiro under the following protocol number: 5.305.099 (CAAE: 54804521.9.0000.5279). Dispensing of the Informed Consent Form was requested for the following reasons: this is a retrospective observational study, which used only information from medical records and other sources of data and clinical information available at the hospital; all data were used without nominal identification of research participants; the results of the study will be published together, not allowing the individual identification of the participants.

RESULTS

Hospitalized patients

Out of 1414 patients hospitalized in April 2021, 1 patient was excluded from the analysis because he was younger than 18 years of age. A total of 1413 patients remained, from which age, sex, origin, type of bed occupied, length of hospital stay, and clinical outcome were analyzed. Of these, 689 patients (48.76%) were female, 724 (51.23%) were male. The mean age found was 59.12 (with a standard deviation of 13.79) years. Regarding the type of unit the patients came from, 971 (68.71%) came from emergency units (emergency care unit, regional emergency coordination, emergency medical care, or hospital) while 416 (29.44%) came from primary care units (family clinic or municipal health center) and 27 (1.91%) were of unknown origin. Regarding the type of bed occupied, 623 (44.09%) occupied intensive care beds, and 790 (55.90%) occupied infirmary beds. Finally, the length of hospital stay, with a median of 6 (with an interquartile range of 4-10) days, and clinical outcomes were analyzed. Among the 1413 patients analyzed in April 2021, 563 (39.84%) died, 817 (57.82%) were discharged and 33 (2.33%) were transferred to another unit or evaded this institution (**Table 1**).

Table 1 - Characteristics of hospitalized Covid-19 patients in April 2021.

Characteristics	Hospitalized patients (n=1413)
Age, in years	
Min-maximum	18-99
Mean (standard deviation)	59,12 (13,79)
Sex	
Female	689 (48,76%)
Male	724 (51,23%)
Origin	
Emergency unit	971 (68,71%)
Primary care unit	416 (29,44%)
Bed type	
Intensive care	623 (44,09%)
Infirmary	790 (55,90%)
Lenght of stay, in days	
Median (interquartile range)	6 (4-10)
Outcome	
Death	563 (39,84%)
Discharge	817 (57,82%)
Transfer or evasion	33 (2,33%)

Source: Chimeli-Ormonde L, et al., 2022.

Intensive care patients

Out of 624 intensive care patients, 306 were excluded according to the criteria described in the methodology for this specific analysis. From the final sample of 318 patients, the following variables were analyzed: time elapsed from the onset of symptoms to admission, symptoms presented, CT findings, and comorbidities at admission. The median number of days elapsed from the first symptom to hospital admission was 8 (interquartile range of 6-11) days and the most reported symptoms were dyspnea (237; 74.52%), cough (204; 64.15%), fever (146; 45.91%), myalgia (75; 23.58%), headache (53; 16.66%), asthenia (42; 13.20%), fatigue (39; 12.26%) (**Table 2**).

Table 2 - Clinical features of intensive care Covid-19 patients.

Analyzed variables	Intensive care patients (n=318)
Time elapsed from the onset of symptoms, in days	
Median (interquartile range)	8 (6-11)
Symptoms	
Dyspnea	237 (74,52%)
Cough	204 (64,15%)
Fever	146 (45,91%)
Myalgia	75 (23,58%)
Headache	53 (16,66%)
Asthenia	42 (13,20%)
Fatigue	39 (12,26%)
CT findings	
Less than 50%	95 (29,87%)
50%	49 (15,40%)
More than 50%	158 (49,68%)
Ground-glass opacity	299 (94,02%)
Consolidation	207 (65,09%)
Septal thickening	91 (28,61%)
Pleural effusion	27 (8,49%)
Comorbidities	
Yes	268 (84,27%)
No	50 (15,72%)
Systemic arterial hypertension	213 (79,47%)
Diabetes Mellitus	93 (34,70%)
Obesity	61 (22,76%)
Cardiovascular diseases	50 (18,65%)

Source: Chimeli-Ormonde L, et al., 2022.

From the radiological point of view, the admission CT reports of these patients were analyzed. Thus, 95 (29.87%) patients had less than 50% pulmonary involvement, 49 (15.40%) had 50% involvement and 158 (49.68%) had more than 50% pulmonary involvement. Among the CT findings, the most present was ground-

glass opacity (299; 94.02%), followed by consolidation (207; 65.09%), septal thickening (91; 28.61%) and pleural effusion (27; 8.49%).

Regarding comorbidities, 268 patients (84.27%) had some type of comorbidity, while the other 50 (15.72%) denied their presence in the directed anamnesis. Among patients with comorbidities, systemic arterial hypertension was the most present, in 213 patients (79.47%), followed by diabetes mellitus (93; 34.70%), obesity (61; 22.76%), and cardiovascular diseases (50; 18.65%) including coronary artery disease, congestive heart failure, unspecified heart disease, and stroke.

DISCUSSION

The Covid-19 pandemic has spread across the world, bringing great challenges in the field of Medicine and public health management (DA SILVA CC, et al., 2021). In Brazil, the pandemic took on enormous proportions, spreading rapidly across the country and mainly affecting capital cities such as Rio de Janeiro.

The aforementioned hospital has become a reference in terms of Covid-19 care in the city of Rio de Janeiro, with all its beds destined for these patients. Thus, each new wave of SARS-CoV-2 infection increased the number of hospital admissions, reaching a peak during April 2021, with the highest number of patients admitted between the first and last day of that month (1414 patients).

From a broader sample, which comprises all patients admitted in April 2021 at the hospital, it can be observed that there was a similar distribution between female and male patients, with no predominance of patients of a particular sex. Regarding the age of patients at the time of admission, it is noted that there was a predominance of older patients (59.12 ±13.79) being hospitalized for SARS-CoV-2 infection in this hospital. These data corroborate data obtained from the beginning of the pandemic in China, which demonstrates that Covid-19 affects females and males in a similar way, and the mean age found was 57 years (ZHANG JJ, et al., 2020). Recently, a Brazilian study also found a similar mean age of 60 years (RANZANI OT, et al., 2021).

Through the analysis of the origin of the patients, it is possible to perceive a predominance of patients coming from emergency units compared to those coming from primary care units. Some factors could explain this difference in origin, for example, the traditional flow of referrals from emergency units to hospitals, since the direct referral of patients from primary care to this institution was a measure implemented during the pandemic; patients' spontaneous search for emergency units when presenting severe symptoms of Covid-19, which requires more complex care; the availability of an emergency unit to the detriment of a primary care unit close to the patient's home.

Although there was a high number of admissions to intensive care beds (44.09%) in April, even higher than other Brazilian studies that reported 34% and 39.37%, the number of admissions to infirmary beds was even higher (PERES IT, et al., 2021; SOUZA FSH, et al., 2021). This is because, even with the huge amount of deaths worldwide from Covid-19, the number of severe cases still does not exceed the number of mild and moderate cases.

It is worth mentioning that, in a month, discharges and transfers also occur, vacating beds for other patients who need them. In April 2021, the month selected for this study, the length of hospital stay had a median of 6 (interquartile range, 4-10) days, allowing more than one patient to occupy the same bed at different times. A retrospective Brazilian study that analyzed patients hospitalized for Covid-19 from February to August 2020 found a similar result, with a median of 8 days (interquartile range, 4-14) of hospital stay (RANZANI OT, et al., 2021).

Considering that the clinical outcome is very relevant data in the context of the Covid-19 pandemic, which resulted in millions of deaths worldwide, we evaluated the number of deaths, discharges, and transfers or evasions (WHO, 2022). 57.82% of the patients admitted in April were discharged, which confirms that most cases of Covid-19 have a favorable outcome. However, it is important to highlight that the number of patients who occupied intensive care beds was quite significant, demonstrating difficult management of a considerable percentage of those hospitalized for Covid-19. In-hospital mortality was 39.84%, similar to that found in other studies (RANZANI OT, et al., 2021; PERES IT, et al., 2021).

We chose, therefore, to deeply analyze specifically intensive care patients, to understand the factors possibly involved in a more severe course of the disease in our hospital and compare with those reported in the literature (SOUZA-SILVA MVR, et al., 2022; AHLSTRÖM B, et al., 2022). When evaluating the number of days from the onset of symptoms to the time of hospitalization of these patients, it was possible to notice that the patients arrived at the hospital with a median of 8 days (with an interquartile range of 6-11). This finding corroborates data from the Brazilian literature that demonstrate a median of 6 days (with an interquartile range of 3-9) in an analysis of all patients hospitalized for Covid-19 until December 2020 and others that report a median of 7 days (CASTRO MC, et al., 2021; HUANG C, et al, 2020; WANG D, et al., 2020).

However, in the present study, the median of 8 days denotes that most patients who occupied intensive care beds were hospitalized with more than 1 week of symptoms. The relative delay in hospital admission could explain the more severe evolution of Covid-19 in these patients, who required advanced care.

The most reported symptoms were dyspnea, cough, fever, which corroborates what was reported by Souza et al in a March 2021 study, despite some differences in the prevalence of each of these symptoms. Myalgia, headache, asthenia, and fatigue were also prevalent symptoms in our study. Similarly, a meta-analysis showed that symptoms such as fever and dyspnea were associated with disease progression, corroborating our data regarding more severe patients who required intensive care (ZHENG Z, et al., 2020).

Along with the data regarding symptoms, the performance of the admission chest CT was essential to delineate the patient's status at the time of admission to the hospital (YOUNUS S, et al, 2022; CHEN X, et al., 2022). It was possible to determine that almost half of the patients who occupied intensive care beds had more than 50% of pulmonary involvement at the time of hospital admission and that the most prevalent CT finding was ground-glass opacity, present in 94.02% of the patients in the sample.

Other published studies also report that ground-glass opacity is the most common alteration found in patients hospitalized for Covid-19 (ZHU N, et al, 2019; SONG F, et al., 2020). Thus, intensive care patients were characterized by having fever, dyspnea, and significant lung involvement, as observed on CT imaging.

Finally, another factor that caught our attention was the prevalence of comorbidities among intensive care patients admitted in April. The vast majority of patients had some comorbidity (84.27%), a higher prevalence than that reported by Castro MC, et al. (2021) (74.6%). Systemic arterial hypertension was the most prevalent, followed by diabetes mellitus, similar to what was described by the same Brazilian study mentioned and others (KLOKNER SGM, et al, 2021; RIBEIRO AC e UEHARA SCSA, 2022).

In our study, obesity and coronary artery disease were also among the most prevalent comorbidities. In fact, several studies have already reported that the presence of comorbidities such as systemic arterial hypertension, diabetes mellitus, cardiovascular disease, and respiratory disease are risk factors for a more severe evolution of Covid-19 (ZHENG Z, et al., 2020; SOUZA FSH, et al., 2021).

Some limitations of this study include the fact that many patients were excluded from the sample because of missing information in their medical records; the multiplicity of factors involved in the origin of patients, making it difficult to establish a relationship between the type of health unit of origin and clinical evolution; the difficulty in delimiting the patients who occupied intensive care beds since the criterion used for this study regarding the type of bed occupied considered the moment just before death, discharge, transfer or evasion. This is important to highlight since the occupation of beds is dynamic, and the patient may occupy an intensive care bed and an infirmary bed at different times of the same hospitalization.

CONCLUSION

Thus, through this study, it was possible to observe that factors such as a greater number of days between the onset of symptoms and hospital admission, a larger pulmonary involvement at admission, and the presence of comorbidities may be related to a more severe evolution of Covid-19. However, further studies are required to better understand the relationship between the data presented and the severity of the evolution of Covid-19, given the demographic characteristics of the patients treated and the complexity of the functioning of the health system in Rio de Janeiro.

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