ORIGINAL ARTICLE

REVISTA ENFERMAGEM ATUAL IN DERME

CARACTERÍSTICAS CLÍNICAS E LABORATORIAIS DA COVID-19: UMA ANÁLISE NA INTERNAÇÃO HOSPITALAR

CLINICAL AND LABORATORY CHARACTERISTICS FOR COVID-19: ANALYSIS OF HOSPITAL INTERNMENT

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ABSTRACT

Background: The COVID-19 pandemic has been a very serious issue in public health, with high morbidity and mortality rates. The disease has a wide spectrum of clinical symptoms with laboratory alterations. **Objectives:** To analyze the clinical and laboratory characteristics of patients with COVID-19 in hospitalization. **Methodology:** Patients diagnosed with COVID-19 and admitted in a Health Care Unit and in a specialized Municipal Hospital were included. Data were retrieved from the patients´ electronic charts and descriptive statistics were employed. **Results:** 205 patients were included. The most frequent clinical symptoms comprised dyspnoea (48.29%), coughs (30.73%) and myalgia (24.39%). Systemic arterial hypertension was the dominant co-morbidity (73.47%). Most patients also had lymphopenia (73.12%), rise in reactive protein C (97.53%), increase in lactic dehydrogenase (94.52%) and decrease in pO2 (69.00%). **Conclusion:** Data retrieved determined the clinical and laboratory profile of patients with COVID-19 at hospitalization. Results may contribute towards a better analysis of the disease´s pathogeny.

Keywords: COVID-19, signs and symptoms, laboratory test, biomarkers.

RESUMO

Objetivo: Analisar as características clínicas e laboratoriais de pacientes com COVID-19 na internação hospitalar. Métodos: Foram incluídos no estudo pacientes com diagnóstico de COVID-19 internados em uma Unidade de Pronto Atendimento e em um Hospital Municipal de referência para a doença. Os dados foram coletados dos prontuários eletrônicos dos pacientes. Aplicou-se a estatística descritiva. Resultados: Foram incluídos 205 pacientes. Os sinais e sintomas clínicos mais frequentes foram dispneia (48,29%), tosse (30,73%) e mialgia (24,39%). A hipertensão arterial sistêmica foi a comorbidade predominante (73,47%). A maioria dos pacientes apresentou linfopenia (73,12%), elevação na proteína C reativa (97,53%), aumento de desidrogenase láctica (94,52%) e redução na pO2 (69,00%). Conclusões: Os dados gerados possibilitaram determinar o perfil clínico e laboratorial de pacientes com COVID-19 na internação hospitalar. Esses resultados podem contribuir para uma melhor compreensão da patogenia da doença.

Palavras-chave: COVID-19; Sinais e Sintomas; Testes Laboratoriais; Biomarcadores

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INTRODUCTION

In the end of 2019 in Wuhan city, Hubei province, China, a new species of Coronavirus was identified after an outbreak of pneumonia unknown etiology, later the etiologic agent was named Severe Acute Respiratory Syndrome Coronavirus (SARS - CoV-2)[1]. In February 2020, the severe acute respiratory syndrome that was spreading around the world was named by the World Health Organization as Coronavíurs Disease 2019 (COVID-19) and on March 11 of the same year, the disease was characterized as a pandemic[2].

It is estimated that most individuals with COVID-19 are asymptomatic or have only mild symptoms, including fever, fatigue, cough, and myalgia. There may be anosmia, ageusia, nausea, headache, vomiting, abdominal pain, diarrhea, odynophagia and rhinorrhea. The severe cases may include dyspnea, cyanosis, tachypnea, hypotension, decompensation of underlying diseases, lymphopenia and require hospital internment[3,4,5]. The most common complications are Severe Acute Respiratory Syndrome, acute cardiac injury and secondary infection[6].

The similarity of the symptoms COVID-19 with those other pathologies associated with the upper and lower respiratory tract makes the initial disease difficult diagnosis. However, laboratory tests, carried out in the initial phase of the disease, such as Reverse Transcription followed by Polymerase Chair Reaction (RT-PCR) which enables the identification of SARS-CoV-2 RNA and tests that detect viral antigens in the secretion nasal are important to guide clinical management[7].

Different clinical and laboratory characteristics are observed among patients affected by COVID-19. However, dynamic monitoring laboratory tests can be significant to predict the prognosis of patients, especially because the disease is associated with a severe inflammatory process with organ dysfunction[8]. Considerable laboratory parameters for monitoring the progression of COVID-19 include lactic dehydrogenase, prolactin, C-reactive protein, and pro-inflammatory cytokines, as well as biomarkers such as lymphocytes, neutrophils, clotting factors, D-dimer, and oximetry[9,10]

Therefore, knowing the changes in laboratory tests and the signs and symptoms presented by patients affected with COVID-19 during hospitalization can be a useful tool to understand the evolution of the disease, and propose adequate care strategies and conducts. these patients.

OBJECTIVES

The aim was to analyze the clinical and laboratory characteristics of patients with COVID-19 during hospital internment.

MATERIAL AND METHOD

It is an observational and retrospective study, with patients diagnosed with COVID-

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19, admitted to an Emergency Care Unit (UPA) and to a Municipal Hospital of reference for care to COVID-19 in the municipality of Rondonópolis, MT, in the period between January to April 2021.

Subjects with laboratory confirmation for the disease by RT-PCR or by rapid antigen testing from nasopharyngeal swab samples during the study period were included in the study. Patients whose data in the medical records were incomplete and excluded.

Clinical data and results of laboratory tests presented by patients at the time of admission to health institutions were collected. Information was obtained from the patient's electronic medical record and transcribed into a structured form for data collection.

The analyzed variables were classified into blocks:

a) sociodemographic (age and gender)

b) clinical (co-morbidities, duration, COVID) symptoms;

c) hematological parameters (total leukocytes, lymphocytes, monocytes, erythrocytes, hemoglobin, hematocrit, and platelets) ;

d) biochemical parameters (C-reactive protein, sodium, potassium, carbon dioxide partial pressure (pCO2), oxygen partial pressure (pO2), pH, and bicarbonate).

Data were tabulated using the Microsoft Excel 2013 program and analyzed using the JASP program. Descriptive statistics were performed. Continuous variables were expressed as mean with standard deviation, median, minimum and maximum values. Categorical variables were expressed as absolute and relative frequency.

RESULTS

A total of 205 patients were included in the present study, 111 (54.15%) male, mean age 57.13 years (Standard deviation: 17.41, Minimum=13 and Maximum=94). The most frequent clinical signs and symptoms in the studied population were dyspnea (48.29%), cough (30.73%), myalgia (24.39%), and fever (20.00%). The average period of onset of signs and symptoms before hospital admission was 8.3 days.

The prevalence of comorbidities in patients hospitalized for COVID-19 was 47.80%. The most frequent comorbidities were systemic arterial hypertension (73.47%), diabetes mellitus (31.63%), and obesity (13.26%). Table 1 describes the sociodemographic and clinical characteristics of the studied population.

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Table 1 - Sociodemographic and clinical characteristics of individuals with COVID-19. Rondonópolis, MT, 2021.

Variable	N (%)
Gênero	
Female	94 (45.85)
Male	111 (54.15)
Age years)	
Median (Min - Max)	57 (13 - 94)
13 to 39	29 (14.14)
40 to 59	91 (44.39)
60 or more	85 (41.46)
Comorbidities	
Yes	98 (47.81)
Not	107 (52.19)
Systemic arterial hypertension	72 (73.47)
Diabetes mellitus	31 (31.63)
Obesity	13 (13.26)
Heart disease	7 (7.14)
Cancer	3 (3.06)
Alzheimer's	1 (1.02)
Leprosy	1 (1.02)
Epilepsy	1 (1.02)
Leprosy	1 (1.02)
Psychiatric disorder	1 (1.02)
Duration of symptoms before admission in days	
Average	8.3
up to 7	86 (42.00)
8 to 14	108 (53.00)
15 or more	11 (5.36)
Clinical signs and symptoms on admission	
Dyspnea	99 (48.29)
Cough	63 (30.73)
Myalgia	50 (24.39)
Fever	41 (20)
Asthenia	5 (17.07)
Headache	23 (11.21)
Anosmia	17 (8.29)
Ageusia	13 (6.34)
Nausea and puke	17 (8.29)

Source: The authors

The analysis of hematological data revealed that most cases had values within the normal range for the count of total leukocytes (68.29 %), monocytes (88.44%), erythrocytes (81.00%), and platelets (88.67 %), as well as for the values of hematocrit (80.00%) and hemoglobin (84.39%). Lymphopenia was observed in most patients (73.13%), with a median of 496.00 cells per mm3 (Table 2).

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Table 2 - Hematological individuals parameters with COVID-19. Rondonópolis, MT, 2021.

Variable	N (%)
Leukocyte count (4000 - 11000 /mm³)	
Median per mm3	7.520
Normal	120 (68.29)
High	52 (25.36)
Reduced	13 (6.34)
Lymphocyte count (1000 - 4.950 /mm³)	
Median per mm^3	496.00
Normal	54 (27.00)
High	0 (0.00)
Reduced	147 (73.13)
Monocyte count (80 - 1100 /mm³)	
Median per mm^3	377.00
Normal	176 (88.44)
High	17 (8.54)
Reduced	6 (3.01)
Red cell count (400 - 540 million/mm³)	
Median per mm^3	4.60
Normal	166 (81.00)
High	1 (0.48)
Reduced	38 (18.53)
Hematocrit (37-45%)	
Median	40.60
Normal	164 (80.00)
High	2 (0.97)
Reduced	39 (19.02)
Hemoglobin Dosage (11.7 - 16.0 g/dL)	
Median g/dL	13.40
Normal	173 (84.39)
High	1 (0.48)
Reduced	31 (15.12)
Platelet count (150000 to 450000 /mm³)	
Median per mm^3	235.967
Normal	180 (88.67)
High	2 (0.98)
Reduced	21 (10.34)

Source: The authors

The patients studied presented increased levels of PCR (97.53%) and lactic dehydrogenase (94.52%) on admission, as well as a reduction in pO2 (69.00%). Sodium, potassium, bicarbonate, pH and pCO_2 values were normal for most cases (Table 3).

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Table 3 - Biochemical parameters of individuals with COVID-19. Rondonópolis, MT, 2021.

Variável	N (%)
C-Reactive Protein (Less than 6 mg/L)	
Median in mg/L	102.90
Normal	5 (2.46)
High	198 (97.53)
Reduced	0 (0.00)
Sodium (136 to 145 mmol/L)	
Median in mmol/L	137.00
Normal	179 (91.00)
High	4 (2.03)
Reduced	14 (7.10)
Potassium (3.6 to 5.5 mmol/L)	
Median in mmol/L	4.30
Normal	176 (90.25)
High	7 (3.59)
Reduced	12 (6.15)
Lactic dehydrogenase (135 to 225 U/L)	
Median in U/L	409.00
Normal	4 (5.479)
High	67 (94.52)
Reduced	0 (0.00)
pCO2 (35 to 45 mmHg)	
Median in mmHg	35.70
Normal	91 (52.29)
High	16 (9.19)
Reduced	67 (35.50)
pO2 (83 to 108 mmHg)	
Median in mmHg	65.15
Normal	39 (22.41)
High	15 (8.62)
Reduced	120 (69.00)
Bicarbonate (21 - 28 Mol/L)	
Median in Mol/L	23.05
Normal	121 (69.54)
High	8 (4.59)
Reduced	45 (26.00)
pH (7.32 to 7.43)	
Median	7.42
Normal	137 (79.65)
High	23 (13.37)
Reduced	12 (7.00)

Source: the authors

DISCUSSION

Patients with COVID-19 included in this research had a mean age of 57.13 years, with a predominance of males (54.15%). The analysis of the demographic patients diagnosed profile with COVID-19 in a public reference hospital in the city of Fortaleza, Ceará, Brazil, revealed that most patients were male, aged between 36 and 60 years[11]. A retrospective

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study in 1335 patients hospitalized for COVID-19 in London, England indicated the mean age was 70 years and 56% were men[12]. A survey conducted in Scotland found that the mean age of patients hospitalized for COVID-19 was 76 years and 52.70% were male[13].

A study that determined factors associated with risk or protection for COVID-19 in southern Brazil showed that the prevalence of hospitalization for COVID-19 is lower for females. The authors suggest that biological differences between men and women should reflect distinct immune responses, impacting the course of the disease[14]. Individual genetic susceptibility and environmental influences on virus infection should also be considered, which can result in different clinical phenotypes between populations and countries[15]

According to the Ministry of Health, fever, cough, dyspnea, myalgia and fatigue are considered the most common signs and symptoms in COVID-1916. In the population studied, there was a predominance of dyspnea, cough, and fever. Liu et al., described that fever, cough, and fatigue were the most prevalent symptoms in cases of hospitalization for COVID-19. In the study by Teich et al., the most common clinical manifestations in patients hospitalized for COVID-19 were headache, cough, and nasal congestion4. Variations in clinical manifestations are due, among other properties, to differences in age, morbidity, social and cultural conditions, and health care. Identifying the main clinical characteristics of patients infected with SARS-CoV-2 may contribute to the management of the disease[18]

The most frequent comorbidities were systemic arterial hypertension and diabetes mellitus, corroborating previous studies[4,12,13]. The presence of comorbidities is associated with the development of severe COVID-19 and a higher risk of death[9,14,19]. SARS-CoV-2 infection is triggered when the S protein of the virus binds to the angiotensin-2 converting enzyme (ACE2), resulting in an accumulation of angiotensin 2 and a reduction of angiotensin 1-7.

The role of angiotensin 2 in COVID-19 hypertensive patients seems to be crucial because it promotes vasoconstriction, sodium retention, oxidative stress, inflammation and fibrosis, compromising the arterial pressure regulation[20]. ACE2 expression is increased in patients with type 2 diabetes mellitus. This upregulation is associated with chronic inflammation, activation of endothelial cells and insulin resistance which aggravates the inflammatory response and leads to alveolar-capillary barrier dysfunction. COVID-19 is a systemic infection with a significant impact on the hematopoietic system and hemostasis.

Among the hematological alterations, lymphopenia can be considered an important laboratory finding, with relevance for the prognosis of the disease. Most (73%) of the patients analyzed had lymphopenia, as

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described in previous studies[4,23,24,25]. Individuals with severe or critical COVID-19 have a lower lymphocyte count compared to patients with non-severe disease[9,21].

The case-control study by Pan et al. identified that lymphopenia was an independent factor associated with mortality in individuals with severe COVID-19. The reduction in lymphocyte count may result from viral binding to cells with subsequent lysis, exudation of circulating lymphocytes into lung tissues and atrophy of lymphoid organs, which impairs cell renewal.

The analysis of laboratory tests revealed an increase in PCR levels in 97.04% of cases. Among the markers related to the response to the acute-phase inflammatory reaction, PCR is the most sensitive, but with low specificity. The protein activates the complement system through the classical pathway, initiates opsonization, promotes chemotaxis and, finally, stimulates the processes of phagocytosis and lysis of antigens[26]. A frequency of 88% of Iranian patients admitted to a referral hospital for COVID-19 had elevated PCR levels[25]. A study conducted in a hospital in São Paulo – SP, observed that 93% of patients hospitalized for COVID-19 had increased PCR. In patients with COVID-19 admitted to a hospital in Wuhan, China, increased PCR levels were associated with greater disease severity, the highest mean values were observed in the progression phase of the infection.

Another laboratory alteration observed was the reduction in pO2 levels, this finding was also described in other studies8,23. A multicenter cohort study including hospitals in Europe and the United States found that, among other factors, a reduction in O2 saturation levels ≤ 93% was associated with higher mortality from COVID-1927. The main clinical manifestation presented by the studied patients was dyspnea, which can be explained by the frequent observation of a reduction in pO2. Monitoring hypoxemia in these patients is essential for decision-making, both for treatment guidance and for evaluating the prognosis of the infection[23].

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The present study has some limitations, such as incomplete information in some medical records, especially lactic dehydrogenase data, which were not available

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for most patients. it is worth highlighting that limitation is frequent in retrospective studies that use medical records. Future studies including other laboratory tests should be carried out in order to contribute to a better understanding of COVID-19.

CONCLUSIONS

The data presented allowed us to define the clinical and laboratory profile of patients hospitalized for COVID-19 in the southern region of Mato Grosso. The most frequent clinical manifestation was dyspnea and systemic arterial hypertension was the most prevalent comorbidity. Lymphopenia, elevated PCR, lactic dehydrogenase and reduced pO2 were the laboratory alterations observed. These results may contribute to a better understanding of the epidemiology of COVID-19.

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