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Epidemiological aspects of critically ill Covid-19 patients:a non-concurrent cohort study*

Aspectos epidemiológicos de pacientes críticos com Covid-19: estudo de coorte não concorrente

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ABSTRACT

Objective: to analyze the epidemiological aspects and factors associated with the survival of critically ill patients diagnosed with Covid-19. **Method:** this is a non-concurrent cohort study with information from 205 critically ill Covid-19 patients. **Results:** the incidence and lethality of Covid-19 were, respectively, 60.3% and 46.8%. The mean survival time of patients was 21.8 days, and the factors associated with lower survival were high score on the Simplified Acute Physiology Score, shorter time on mechanical ventilation, altered level of consciousness, use of a central venous catheter, presence of coagulopathies and need for cardiopulmonary resuscitation. Patients on oxygen therapy by nasal cannula had better survival. **Conclusion:** there was a high incidence and lethality of the disease among critically ill patients. The lowest survival rate was related to indicators of greater severity of the clinical picture. The results support nurses in planning patient care to minimize the risk of death. **DESCRIPTORS:** COVID-19; Intensive Care Units; Nursing.

RESUMO

Objetivo: analisar os aspectos epidemiológicos e os fatores associados à sobrevida de pacientes críticos com diagnóstico de Covid-19. **Método:** estudo de coorte não concorrente, com informações de 205 pacientes críticos com Covid-19. **Resultados:** a incidência e a letalidade de Covid-19 foram, respectivamente, 60,3% e 46,8%. O tempo médio de sobrevida dos pacientes foi de 21,8 dias e os fatores associados à menor sobrevida foram: pontuação elevada no *Simplified Acute Physiology Score,* menor tempo de ventilação mecânica, alteração do nível de consciência, utilização de cateter venoso central, presença de coagulopatias e necessidade de ressuscitação cardiopulmonar. Pacientes em oxigenoterapia por cateter nasal apresentaram maior sobrevida. **Conclusão:** observou-se elevada incidência e letalidade da doença entre os pacientes críticos, sendo a menor sobrevida relacionada a indicadores de maior gravidade do quadro clínico. Os resultados obtidos subsidiam enfermeiros no planejamento da assistência ao paciente, buscando minimizar o risco de óbito.
DESCRITORES: COVID-19; Unidades de Terapia Intensiva; Enfermagem.

INTRODUCTION

In December 2019, in the city of Wuhan, the capital of Hubei province in China, an outbreak of people with pneumonia of unknown cause occurred. Chinese scientists isolated a new coronavirus called Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) from samples of these patients due to its similarity to the virus that causes Severe Acute Respiratory Syndrome (SARS). The disease caused by this new coronavirus has been designated as Coronavirus Disease 2019 (Covid-19), considered a pandemic by the World Health Organization (WHO) in March 2020[1,2].

The transmission of the SARS-CoV-2 virus occurs by respiratory droplets during the regular speech, coughing, sneezing, and through aerosols from symptomatic people. Clinical manifestations may appear between one and fourteenth days after exposure[3].

The number of cases of Covid-19 has increased exponentially in several countries worldwide. According to WHO data released until July 9, 2021, there were 185,291,530 confirmed cases and 4,010,834 deaths[4]. According to data released by the Brazilian Ministry of Health (MS), on July 10, 2021, Brazil reported 19,069,003 confirmed cases and 532,893 deaths[5].

Although most people with Covid-19 develop the disease with mild or moderate symptoms, approximately 15% manifest the severe form, which requires hospitalization with supplemental oxygen support. Among patients with the severe form of the disease, 5% have complications such as respiratory failure, Acute Respiratory Distress Syndrome (ARDS), sepsis, septic shock, thromboembolism, acute kidney failure, and heart damage. Advanced age, smoking history, and underlying non-communicable diseases, such as arterial hypertension, chronic lung disease, obesity, and cancer, have been reported as risk factors for the worsening of the disease and worse prognosis[3].

In the world and Brazil, with the progression of the pandemic, a greater demand for Intensive Care Unit (ICU) beds has been observed for patients with severe forms of the disease, which caused an overload on the health system. In Brazil, the existing regional disparities, especially concerning access to health services and the concentration of ICU beds in the Southeast Region, aggravated the impact of Covid-19. Between February and August 2020, 205,493 ICU admissions of Covid-19 patients were registered in Brazil, of which 59% died. When evaluating mortality by region, it is clear that these values in the North and Northeast were even higher, representing 79% and 66%[6].

In this context, a crisis began with a high number of critically ill patients waiting for healthcare. Despite efforts to acquire equipment and create new ICU beds, the number of specialized intensive care professionals was insufficient to meet the demand of critically ill patients. Thus, health institutions and managers were forced to hire professionals with less experience to assist in the treatment of these patients without prior training[7,8].

Given the high transmission of SARS-CoV-2 in the population, the uncertainties arising from the development of the disease and the consequences for patients, as well as the great demand for ICU beds and the difficulty in adapting hospitals to face the pandemic, the following question emerged: what are the epidemiological aspects and factors associated with the survival of critical Covid-19 patients admitted to a philanthropic hospital in Belo Horizonte, Minas Gerais (MG)?

Thus, the objective of this study was to analyze the epidemiological aspects and factors associated with the survival of critically ill patients diagnosed with Covid-19.

METHOD

A non-concurrent cohort study was carried out based on information available in the medical records of critically ill Covid-19 patients admitted to the ICU of a philanthropic hospital in Belo Horizonte, MG, Brazil, from May to December 2020. This ICU has 30 beds, structured for the care of patients with suspected or confirmed Covid-19 due to the demand caused by the pandemic.

The study population consisted of 340 critically ill patients admitted to the ICU-Covid during the study period. Patients aged 18 years or older, confirmed with COVID-19 through clinical and laboratory diagnoses, were included. Patients with an inconclusive or negative Covid-19 laboratory test result were excluded. The final sample consisted of 205 patients who had their medical records evaluated. Data from medical records were collected using an instrument elaborated by the researchers, containing characterization data and clinical and epidemiological information. Data collection was carried out from January to March 2021.

The variables collected were: hospitalization outcome (discharge/death), age, gender, origin, presence of comorbidities, date of admission to the ICU, date of hospitalization outcome, length of stay in the ICU, time until the occurrence of the hospitalization outcome, Simplified Acute Physiology Score (SAPS III), clinical manifestations presented by the patient, invasive devices used, interventions performed (hemodialysis, blood transfusion, prone positioning, cardiopulmonary resuscitation, and virtual visit), and pharmacological treatments administered.

Data were double-entered into Microsoft Office Excel software, version 2016. Then, they were exported and analyzed using the Statistical Package for Social Sciences, version 23.0.

Descriptive and inferential analyzes were performed. The Kolmogorov-Smirnov test evaluated the normality of the variables. For descriptive analysis, absolute and relative frequency distributions, measures of central tendency, and variability measures were used, according to the normality test results.

The incidence and lethality rates of Covid-19 among critically ill patients were calculated. The characteristics of critically ill patients who survived or not were compared to identify the differences between the profiles of these patients. Categorical variables were compared using Pearson's chi-square test. We used the Student's T-test for independent samples (parametric variables) and the Mann Whitney test (variables with non-parametric distribution) for numerical variables. The values of $p<0.05$ were considered statistically significant.

Survival analysis was performed to assess the factors associated with the survival of critically ill Covid-19 patients, considering as a dependent variable the observation time, in days, until the occurrence of the outcome. The outcomes were death or discharge, indicating the end of the observation period (censorship). The Kaplan-Meier estimator was used to estimate the probability of survival of critically ill Covid-19 patients.

The Log-rank, Breslow, and Tarone-Wire tests were applied to determine the statistical significance of the survival curves. The variables that presented $p<0.05$ in all three tests were adopted as significant variables[9]. Variables with statistical significance were included in the multivariate analysis using Cox regression. The Hazard Ratio (HR) and the respective 95% Confidence Intervals (95%CI) were estimated to identify the factors associated with the death of critically ill Covid-19 patients.

The study complied with the Guidelines established in Resolution 466/12 of the National Health Council. Data collection began after approval by the Research Ethics Committee of the proposing institution, under opinion No. 4,349,612, and by the Research Ethics Committee of the co-participating institution, under opinion No. 4,465,956.

RESULTS

During the period evaluated, 340 critically ill patients were hospitalized. The incidence of critically ill patients hospitalized due to Covid-19 was 60.3% (205 patients), with a case fatality rate of 46.8%. From the comparison of patients who died or not, it was found that among those who died, there was a greater proportion of elderly patients ($p=0.001$), males ($p=0.036$), and patients who had comorbidities prior to hospitalization ($p=0.020$), as shown in Table 1.

Table 2 compares the clinical and epidemiological characteristics of critically ill Covid-19 patients who survived or not. Notably, patients who died had higher SAPS III scores and higher estimated mortality ($p<0.001$).

Regarding the pharmacological treatments used by patients during ICU stay, it was found that among patients who died, there was a higher proportion of patients who used sedatives (91.7%) and vasoactive drugs (92.7%) when compared to those who survived ($p<0.05$), as shown in Table 3.

The mean patient survival time was estimated at 21.8 days. In the univariate analysis, there was a difference in the mortality of critically ill Covid-19 patients concerning the SAPS III score, estimated SAPS III mortality, altered level of consciousness, coagulopathy, acute pain, hypertension, hypotension, use of CVC, oxygen therapy by nasal cannula, invasive mechanical ventilation (IVM), IMV duration, CPR, and use of antihypertensive, sedative and vasoactive drugs (Log rank $p<0.05$; Breslow $p<0.05$; and Tarone-Ware $p<0.05$), as shown in Table 4.

In the multivariate analysis, based on Cox regression, the following factors were found to be associated with lower survival of critically ill patients: higher SAPS III score (HR: 1.021; 95%CI: 1.004-1.039), presence of altered level of consciousness (HR: 2.260; 95%CI: 1.078-4.735), shorter IMV duration (HR: 0.854; 95%CI: 0.819-0.889), use of CVC (HR: 3.166; 95%CI: 1.167-8.592), presence of coagulopathies (HR: 2.065; 95%CI: 1.097-3.886), and need for cardiopulmonary resuscitation (HR: 2.347; 95%CI:

Table 1 - Characteristics of critically ill patients diagnosed with Covid-19 (n=205). Belo Horizonte, MG, Brazil, 2020

Variables	Survivors (n=109)	Non-Survivors (n=96)	p-value
Average age (years) (Q_1-Q_3)	63.0(53.0-71.0)	68.0 (60.2-77.0)	0.001
<60 years	42 (38.5)	21 (21.9)	0.010
≥ 60 years	67 (61.5)	75 (78.1)	
Gender n (%)			0.036
Female	46 (42.2)	27 (28.1)	
Male	63 (57.8)	69 (71.9)	
Origin n(%)			0.551
Wards	43 (39.4)	38 (39.6)	
Emergency service	28 (25.7)	27 (28.1)	
Outpatient units	17 (15.6)	15 (15.6)	
Intensive Care Units	-	2 (2.1)	
Other	21 (19.3)	14 (14.6)	
Comorbidities n (%)			0.020
No	13 (11.9)	3 (3.1)	
Yes	96 (88.1)	93 (96.9)	
Type of comorbidities n (%)			
Systemic Arterial Hypertension	68 (62.4)	71 (74.0)	0.077
Diabetes mellitus	36 (33.0)	30 (31.3)	0.881
Neoplasms	28 (25.7)	27 (28.1)	0.694
Obesity	28 (25.7)	15 (15.6)	0.077
COPD	9 (8.3)	20 (20.8)	0.010
Dyslipidemia	14 (12.8)	15 (15.6)	0.569
Chronic Kidney Disease	9 (8.3)	16 (16.7)	0.066
Acute myocardial infarction	11 (10.1)	11 (11.5)	0.752
Psychiatric Disorder	10 (9.2)	11 (11.5)	0.590
Heart disease	12 (11.0)	9 (9.4)	0.700
Stroke	4 (3.7)	6 (6.3)	0.520
Pneumonia	4 (3.7)	5 (5.2)	0.592
Asthma	3 (2.8)	3 (3.1)	1,000
Dementia	3 (2.8)	2 (2.1)	1,000

Source: Elaborated by the authors, 2021.

1.529-3.602). In addition, it was found that patients who received oxygen therapy through nasal cannula had greater survival than those who did not use this device during ICU stay (HR: 0.176; 95%CI: 0.108-0.285), as shown in Table 5.

DISCUSSION

The pandemic imposed by the new coronavirus caused an increase in the number of patients admitted to the ICU with a diagnosis of Covid-19 and an increase in mortality. In Brazil, until December 2020, 59.0% of ICU admissions and 30.7% of

Table 2 - Clinical and epidemiological characteristics of critically ill patients diagnosed with Covid-19 (n=205). Belo Horizonte, MG, Brazil, 2020 (continue)

Variables	Survivors (n=109)	Non-Survivors (n=96)	p-value
Length of ICU stay (days) med (Q_1-Q_3)	8.0 (3.0-13.5)	7.0 (3.2-18.0)	0.129
SAPS III score m(±sd)	47.8 (±12.8)	57.4 (±12.9)	<0.001
Estimated SAPS III Mortality m(±sd)	20.0% (±18.5)	32.7% (±22.3)	<0.001
Clinical Manifestations n(%)			
Ageusia	8 (7.3)	3 (3.1)	0.224
Agitation	1 (0.9)	5 (5.2)	0.067
Alteration of the level of consciousness	43 (39.4)	87 (90.6)	<0.001
Anosmia	11 (10.1)	5 (5.2)	0.193
Anxiety	12 (11.1)	9 (9.4)	0.684
Septic shock	24 (22.0)	51 (53.1)	<0.001
Coagulopathies	4 (3.7)	12 (12.5)	0.019
Mental confusion	15 (13.8)	20 (20.8)	0.179
Convulsion	1 (0.9)	5 (5.2)	0.100
Acute pain	49 (45.0)	27 (28.1)	0.013
Skin rashes	24 (22.0)	25(26.0)	0.500
Fatigue	21 (19.3)	16 (16.7)	0.629
Fever	65 (59.6)	65 (67.7)	0.231
Weakness	13 (11.9)	17 (17.7)	0.243
Bleeding	3 (2.8)	9 (9.4)	0.044
Hyperglycemia	59 (54.1)	63 (65.9)	0.094
Arterial hypertension	63 (57.8)	40 (41.7)	0.021
Arterial hypotension	245 (22.0)	57 (59.4)	<0.001
Hypoxemia	42 (38.5)	59 (61.5)	0.001
Liver injury	31 (28.4)	34 (35.4)	0.284
Lung injury	61 (56.0)	68 (70.8)	0.028
Acute kidney injury	44 (40.4)	72 (75.0)	<0.001
Myalgia	21 (19.3)	15 (15.6)	0.494
Nausea	4 (3.7)	7 (7.3)	0.354
SARS	43 (39.4)	57 (59.3)	0.003
Tachycardia	20 (18.3)	30 (30.1)	0.032
Tachypnea	97 (89.0)	84 (87.5)	0.740
Dizziness	2 (1.8)	1 (1.0)	1,000
Cough	87 (79.8)	71 (74.0)	0.319
Vomiting	7 (6.4)	9 (9.4)	0.432
Invasive devices n(%)			
Nasoenteric tube (NET)	47 (43.1)	69 (71.9)	<0.001
Central venous catheter (CVC)	53 (48.6)	91 (94.8)	<0.001

Source: Elaborated by the authors, 2021.

Table 2 - Clinical and epidemiological characteristics of critically ill patients diagnosed with Covid-19 (n=205). Belo Horizonte, MG, Brazil, 2020 (conclusion)

Variables	Survivors (n=109)	Non-Survivors (n=96)	p-value
Indwelling Urinary Catheter (IDC)	69 (63.3)	88 (91.7)	<0.001
Peripheral venous catheter (PVC)	103 (94.5)	91 (94.8)	0.925
Drains	-	6 (6.3)	0.010
Invasive blood pressure (IBP)	103 (94.5)	96 (100.0)	0.020
Oxygen therapy through nasal cannula (NC)	97 (89.0)	31 (32.3)	<0.001
Oxygen therapy through macro mask	12 (11.0)	7 (7.3)	0.360
Oxygen therapy through reservoir mask	68 (62.4)	48 (50.0)	0.074
Invasive mechanical ventilation (IMV)	48 (44.0)	94 (97.8)	<0.001
Non-invasive ventilation	17 (15.6)	19 (19.8)	0.431
IMV days m (±dp)	4.0 (± 6.4)	10.5 (± 10.7)	<0.001
Interventions carried out n(%)			
Hemodialysis	14 (12.8)	61 (63.5)	<0.001
Blood transfusion	15 (13.8)	35 (36.5)	<0.001
Prone positioning	52 (47.7)	47 (49.0)	0.858
Cardiopulmonary resuscitation (CPR)	5 (4.6)	44 (45.8)	<0.001
Virtual visit	91 (83.5)	75 (78.1)	0.329

Source: Elaborated by the authors, 2021.

deaths were due to Covid-19[7]. Among the patients evaluated in this study, there was a case fatality rate of 46.8%, similar to the result of a cohort with 3,988 Italian patients, whose case fatality rate was 48.7%[10]. In another study with 103 patients admitted to an ICU in New Jersey, the case fatality rate was even higher, reaching 61.1%[11]. Thus, it is understood that lethality can be influenced by different factors, which include aspects related to the management and organization of the services and characteristics of the patients themselves, such as advanced age, male gender, and comorbidities including arterial hypertension, diabetes mellitus, and obesity[1,6,7,10,11].

This study found that a higher SAPS III score was associated with lower patient survival, demonstrating a relationship between the mortality estimated by this score and the actual mortality of patients. Different researchers have also described that Covid-19 patients admitted to the ICU with a higher SAPS III score evolved negatively and died[12,13].

It is important to highlight that many patients present a worsening clinical picture while waiting for ICU beds in Emergency Care Units in Brazil (UPAs in Portuguese), Emergency Rooms (ERs), or general wards. In these units, patients receive initial care, guided by clinical protocols, to control their clinical condition and reduce lethality while waiting for specialized care[3]. However, this reorganization of care and services appears to configure major challenges imposed by the pandemic. According to data from the Minas Gerais State Health Department, on May 27, 2021, 253 patients were waiting for admission to ICU beds and another 410 to hospital beds. A study carried out in Brazil evaluated 522,167 medical records of patients with positive Covid-19, hospitalized in a public and private network, and it was described that admission to the ICU was one of the predictive factors for mortality since, on average, patients took six days to be admitted[7].

It is emphasized that critical patients generally have significant complications from Covid-19, especially pulmonary involvement. A national study showed that 47.8% of Covid-19 patients

Table 3 - Pharmacological treatments used by critically ill patients diagnosed with Covid-19 (n=205). Belo Horizonte, MG, Brazil, 2020

Variables	Survivors (n=109)	Non-Survivors (n=96)	p-value
Pharmacological classes n(%)			
Beta-adrenergic agonist	29 (26.6)	28 (29.2)	0.683
Analgesics	58 (53.2)	69 (71.9)	0.006
Antibiotics	106 (97.2)	94 (97.9)	0.757
Anxiolytics	17 9 (15.6)	19 (19.8)	0.431
Antacids	93 (85.3)	87 (90.6)	0.247
Antidiabetic drugs	59 (54.1)	64 (66.7)	0.067
Anticoagulants	102 (93.6)	85 (88.5)	0.204
Antifungals	12 (11.0)	19 (19.8)	0.080
Antihypertensives	46 (42.2)	24 (25.0)	0.010
Anti-inflammatories	2 (1.8)	6 (6.3)	0.150
Antiplatelet	4 (3.7)	6 (6.3)	0.520
Antivirals	28 (25.7)	23 (24.0)	0.775
Antipyretics	41 (37.6)	57 (59.4)	0.002
Beta blockers	8 (7.3)	10 (10.4)	0.437
Neuromuscular blockers	22 (20.2)	49 (51.0)	<0.001
Corticosteroids	83 (76.1)	77 (80.2)	0.483
Diuretics	33 (30.3)	40 (41.7)	0.089
Immunosuppressants	1 (0.9)	6 (6.3)	0.036
Sedatives	50 (45.9)	88 (91.7)	<0.001
Vasoactive drugs	51 (46.8)	89 (92.7)	<0.001

Source: Elaborated by the authors, 2021.

admitted to the ICU were from ERs, and 60.3% arrived intubated on IMV[12]. In this study, shorter survival was associated with shorter IMV time, which may be related to late admission to the ICU, so that patients had greater disease severity and, consequently, died in the first days of ventilatory support. A study in São Paulo identified that the high severity of the disease at admission and the higher mortality of patients could be explained by the delay in ICU admission, reflecting the difficulties in accessing healthcare[13].

It is noteworthy that, in this study, the altered level of consciousness in critically ill patients was also a predictor of mortality. Similar results were found in multicentric studies carried out in several ICUs worldwide. These described that most patients admitted with ARDS due to Covid-19 were intubated in the first 24 hours, increasing the use of sedatives and neuromuscular blockers, resulting in more unconscious patients. These studies identified that patients with a long period of sedation and immobilization who were far from their families had a worse outcome[14]. It is emphasized that sedation is included as a measure for treating Covid-19 patients, whose management must be individualized and adjustable over time to allow the patient to tolerate IMV, maintain an adequate oxygenation level, and reduce accidental extubation rates[15].

Another variable associated with lower survival found in this study was the use of CVC. A study with 1,000 intensive care physicians and anesthesiologists in France, Switzerland, Belgium, Portugal, and Brazil described that 98% of critically ill Covid-19 patients used CVC for drug administration and 79% for venous oxygen sat-

Table 4 - Log rank, Breslow, and Tarone-Ware test results for the factors associated with survival of critically ill patients diagnosed with Covid-19 (n=205). Belo Horizonte, MG, Brazil, 2020

Variable	Log rank (p-value)	Breslow (p-value)	Tarone-Ware (p-value)
SAPS III score	<0.001	<0.001	<0.001
Estimated SAPS III mortality	<0.001	<0.001	<0.001
Altered level of consciousness	0.008	0.002	0.004
Coagulopathies	0.004	0.004	0.003
Acute pain	0.000	0.002	0.000
Hypertension	0.000	0.000	0.000
Hypotension	0.015	0.009	0.009
Central venous catheter	0.011	0.006	0.007
Oxygen therapy through nasal cannula	<0.001	<0.001	<0.001
IMV	0.001	0.001	0.001
IMV duration (days)	<0.001	<0.001	<0.001
Cardiopulmonary resuscitation	<0.001	<0.001	<0.001
Antihypertensive drugs	<0.001	<0.001	<0.001
Sedatives	0.048	0.019	0.023
Vasoactive drugs	0.017	0.005	0.007

Source: Elaborated by the authors, 2021.

Table 5 - Results of the final Cox multivariate regression model for factors associated with lower survival of critically ill patients diagnosed with Covid-19 (n=205). Belo Horizonte, MG, Brazil, 2020

Variables	HR	95%CI	p-value
SAPS III score	1.021	1.004-1.039	0.017
Invasive mechanical ventilation duration	0.854	0.819-0.889	<0.001
Altered level of consciousness	2,260	1,078-4,735	0.031
Use of central venous catheter	3,166	1,167-8,592	0.024
Coagulopathies	2,065	1,097-3,886	0.025
Cardiopulmonary resuscitation	2,347	1,529-3,602	<0.001
Oxygen therapy by nasal cannula	0.176	0.108-0.285	<0.001

Source: Elaborated by the authors, 2021.

uration measurement[16]. Thus, it is noteworthy that Covid-19 patients admitted to the ICU can develop hemodynamic instability, and the use of the CVC is needed for drug administration and hemodynamic monitoring. Despite the importance of using the CVC for the treatment of patients, the risks related to this device cannot be ignored, especially the risk of infection, which can contribute to the worsening of the patient's general condition[17].

In this research, it was found that the presence of coagulopathies was also associated with lower patient survival. A meta-analysis of 35 studies suggests that the worsening of coagulation parameters may indicate progressive Covid-19 severity and a worse prognosis[18]. In this context, the importance of antithrombotic therapy in the daily management of Covid-19, which had already been implemented in this study's scenario, is reinforced.

The clinical severity caused by the coronavirus can also lead patients to develop myocardial injury and cardiorespiratory arrest due to severe respiratory failure, hemodynamic instability, arrhythmias, septic shock, and hydro electrolytic disorders. The present study found a strong association between cardiorespiratory arrest and increased mortality, which is considered an indicator of worsening. In a study in Rio de Janeiro, cardiac involvement was also associated with a worse prognosis among critically ill Covid-19 patients[19].

It is important to emphasize that patients who received oxygen therapy by nasal cannula for some period during their ICU stay had greater survival than those who did not use this device. This finding can be explained by the fact that oxygen therapy through the nasal cannula is recommended at the initial stage of the treatment for patients with minor pulmonary involvement, as this device offers an oxygen supply of up to 5L/min without the need for humidification[3]. Thus, patients who used this device at some point during their stay in the ICU were less severely compromised.

A study carried out in the ICU with Covid-19 patients showed satisfactory results with the use of the High Flow Nasal Catheter (HFNC) and a Non-Invasive Ventilation (NIV) mask. These devices reduced the number of patients undergoing IMV, reducing hospitalization time, infection, and mortality. The WHO recommends these devices provided professionals use Personal Protective Equipment (PPE) correctly[8].

Due to the tropism of the coronavirus spike (S) protein for type II alveolar epithelial cells, this viral infection can provoke an unregulated inflammatory response, causing tissue damage to lung cells, which culminates in pulmonary microvascular thrombosis, hindering gas exchange and predisposing to acute respiratory insufficiency[20]. Therefore, early and individualized care is important, guided by evidence-based clinical protocols[3].

It is important to note that the ICU in this study faced several challenges imposed by the pandemic, such as the need to add hospital beds in a few days, and the acquisition of new medical equipment that is not frequently available in the clinical wards, and the immediate hiring of professionals. In addition, there was a shortage of medicines in Minas Gerais, Brazil, requiring professionals to evaluate new protocols for the dilution and administration of the most commonly used drugs. However, efforts by managers and professionals were directed toward training new professionals and updating clinical protocols to ensure quality care for patients with suspected or confirmed Covid-19.

This study has as a limitation the fact that it was carried out in a single ICU, which limits the generalization of the results due to the disparities in each region of the country. There is also the fact that documental analysis of the data available in medical records was used and not at the bedside. However, it is noteworthy that the sample of this study was larger than that found in other studies that analyzed data from only one ICU.

CONCLUSION

During the pandemic imposed by the new coronavirus, a high incidence of Covid-19 was observed among critically ill patients, with a predominance of elderly male patients who had some comorbidity. Although most patients were discharged from the ICU, there was a high mortality rate from Covid-19 among critically ill patients, demonstrating the high severity of this public health problem. The lowest patient survival was associated with patients with greater clinical severity, identified by the higher SAPS III score, shorter IMV time, presence of altered level of consciousness, use of CVC, presence of coagulopathies, and need for cardiopulmonary resuscitation. On the other hand, patients who used oxygen therapy by nasal cannula during hospitalization had greater survival.

It is believed that the findings of this study can help researchers, health professionals, and managers to know the epidemiological aspects and factors associated with the survival of critically ill Covid-19 patients and, thus, be able to outline work methodologies that contribute to minimizing the worsening of this disease, which remains a challenge.

It should be noted that the crisis triggered by the coronavirus disease should provide opportunities for the implementation of systemic approaches, according to the best available evidence.

CONFLICT OF INTEREST

The authors have declared that there is no conflict of interest.

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