

## Artículo de investigación original

# Clinical characterization and outcomes in patients admitted to ICU with SARS-COV2 in Colombia's coffee triangle region.

## Caracterización clínica y desenlaces en pacientes admitidos a UCI con SARS-CoV2 en la región del Eje Cafetero, Colombia.

Melissa González<sup>1,a,b</sup>, María Fernanda Jiménez<sup>2,a,b</sup>, Jaime Andrés Hoyos<sup>3,a,b,c</sup>, Andrés Alirio Restrepo<sup>3,a,b,c</sup>, Juan Guillermo Buitrago<sup>3,a,b</sup>, Carolina Hermida Ortiz<sup>2,a,b</sup>, Brahyán Osorio<sup>4,a,b</sup>, Cristhian Morales<sup>5,d,e,f</sup>

1. Médica, Especialista en Medicina Crítica y Cuidado Intensivo, Magíster (c) en Bioética y Bioderecho.
  2. Médica, Especialista en Medicina Crítica y Cuidado Intensivo.
  3. Médico, Especialista en Medicina Crítica y Cuidado Intensivo.
  4. Médico.
  5. Médico, Especialista en Salud Pública, Residente de Medicina Forense.
- a. Grupo de Investigación Medicina Crítica y Cuidados Intensivos GIMCCI Universidad Tecnológica de Pereira (Colombia).
  - b. Departamento de Medicina Crítica, Facultad de Ciencias de la Salud, Universidad Tecnológica de Pereira (Colombia).
  - c. Departamento de Medicina Crítica, Hospital Universitario San Jorge de Pereira (Colombia).
  - d. Departamento de Salud Pública, Facultad de Salud, Universidad Autónoma de Manizales (Colombia).
  - e. Especialización en Medicina Forense, Facultad de Ciencias de la Salud, Pontificia Universidad Javeriana Cali (Colombia).
  - f. Grupo Investigaciones ACH, Asociación Colombiana de Hepatología.

### CORRESPONDENCIA

Cristhian Morales  
ORCID ID <https://orcid.org/0000-0002-1606-8398>  
Universidad Autónoma de Manizales (Colombia).  
E-mail: [cristhiand.morales@autonoma.edu.co](mailto:cristhiand.morales@autonoma.edu.co)

### CONFLICTO DE INTERESES

Los autores del artículo hacen constar que no existe, de manera directa o indirecta, ningún tipo de conflicto de intereses que pueda poner en peligro la validez de lo comunicado.

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### ABSTRACT

**Introduction:** The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has become a public health threat because it results in admission to the intensive care unit (ICU). **Objective:** This study aims to describe the clinical characteristics of patients with COVID-19, and the outcomes among people admitted to ICU in the Coffee Triangle region in Colombia. **Patients and Methods:** We conducted a retrospective observational study performed in the Colombian Coffee Triangle region, located in the centre of Colombia. All patients with a laboratory-confirmed SARS-CoV-2 infection referred or admitted to an ICU in three hospitals between December 1, 2020, to January 1, 2021, were enrolled. The clinical parameters, treatment, complications, and outcomes of the patients are described. **Results:** 171 patients were enrolled, the average age was 60 years, and mainly men (63.7%). The main comorbidities were arterial hypertension (59.6%), and type 2 diabetes mellitus (DM) (31.6%). The main symptoms were dyspnoea (90.6%), and general malaise (83%). Diffuse bilateral alveolar opacities (58.5%) were the most important imaging finding. 73% of the patients received broad-spectrum antibiotic therapy during their ICU stay; however, only 52.05% of patients received a bacterial superinfection diagnostic confirmed by microbiological tests. **Conclusions:** This is the first characterisation of critical COVID-19 patients in the coffee triangle region in Colombia. Continuing to generate knowledge about COVID-19 in each territory is essential in order to optimise the management, life support, and clinical decisions for COVID-19 patients.

**Key words:** Coronavirus infections, diagnosis, signs and symptoms, comorbidity, intensive care units, mortality.

### RESUMEN

**Introducción:** El coronavirus 2 del síndrome respiratorio agudo severo coronavirus-2 (SARS-CoV-2) se ha convertido en una amenaza para la salud pública porque resulta en el ingreso en la unidad de cuidados intensivos (UCI). **Objetivo:** Este estudio tiene como objetivo describir las características clínicas de los pacientes con COVID-19 y los desenlaces entre las personas ingresadas en la UCI en la región del eje Cafetero en Colombia. **Pacientes y Métodos:** Estudio observacional retrospectivo realizado en la región del eje Cafetero, Colombia. Ingresaron todos los pacientes con infección por SARS-CoV-2 confirmada por laboratorio remitidos o ingresados en la UCI en tres hospitales entre el 1 de diciembre de 2020 y el 1 de enero de 2021. Posteriormente, se describieron los parámetros clínicos, el tratamiento, las complicaciones y los resultados de los pacientes. **Resultados:** 171 pacientes, edad promedio 60 años, principalmente hombres (63,7%). Las principales comorbilidades fueron hipertensión arterial (59,6%) y diabetes mellitus tipo 2 (DMII) (31,6%). Los principales síntomas fueron disnea (90,6%) y malestar general (83%). Las opacidades alveolares bilaterales difusas (58,5%) fueron el hallazgo más importante de la imagen. El 73% de los pacientes recibieron tratamiento antibiótico de amplio espectro durante su estancia en la UCI; sin embargo, solo el 52,05% de los pacientes recibieron un diagnóstico de sobreinfección bacteriana confirmado por pruebas microbiológicas. **Conclusiones:** Es la primera caracterización reportada en pacientes críticos de COVID-19 en la región del triángulo cafetero en Colombia. Seguir generando conocimiento sobre el COVID-19 en cada territorio es fundamental para optimizar la gestión, el soporte vital y las decisiones clínicas sobre los pacientes con COVID-19.

**Palabras clave:** Infecciones por coronavirus, diagnóstico, signos y síntomas, comorbilidad, unidades de cuidados intensivo, mortalidad.

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## INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was first identified in Wuhan, China, and has since become a global public health threat.<sup>1,2</sup> The outbreak spread rapidly across different regions of China in January and February 2020.<sup>1,2</sup> The disease, now known as COVID-19 (Coronavirus Disease 2019), continued to expand to other Asian countries and eventually to other continents.<sup>2</sup> On March 11, 2020, the World Health Organization (WHO) declared COVID-19 a pandemic due to the increasing number of cases and fatalities worldwide.<sup>3</sup> Consequently, the WHO urged all countries to take coordinated action to combat COVID-19, recognizing it as one of the greatest global health emergencies in modern history.<sup>4</sup> Patients infected with SARS-CoV-2 often develop severe symptoms requiring hospitalization, with many necessitating admission to the intensive care unit (ICU).<sup>3,5,6</sup>

The first confirmed case of COVID-19 in Colombia was reported on March 6, 2020, presenting with mild symptoms. Since then, the number of cases has steadily increased nationwide.<sup>7</sup> Approximately 14% of patients develop severe disease requiring respiratory support, and 5% necessitate ICU admission with mechanical ventilation.<sup>5</sup> Many patients admitted to the ICU developed respiratory failure, leading to increased mortality and prompting government efforts to expand ICU capacity.<sup>8</sup> Studies indicate that ICU admission rates for hospitalized COVID-19 patients vary between 5% and 32%, with diverse clinical presentations observed globally.<sup>3</sup> These variations depend on factors such as national healthcare policies, ICU capacity, and efforts to control viral transmission.<sup>3,8</sup>

Comorbidities such as obesity, hypertension, diabetes, chronic obstructive pulmonary disease (COPD), cardiovascular disease, and abnormal laboratory findings, along with advanced age and the lack of specific antiviral treatments, are associated with increased disease severity, ICU admission, and mortality.<sup>3,5,6</sup> Clinicians must recognize these risk factors early to optimize resource allocation and develop policies that improve patient outcomes.<sup>5</sup> Epidemiological data at both local and national levels are essential, as COVID-19 has imposed an unequal burden across different regions. The impact observed in high-income countries does not necessarily reflect that of developing nations.

This study aims to describe the clinical characteristics and outcomes of COVID-19 patients admitted to ICUs in Colombia's Coffee Triangle region.

## PATIENTS AND METHODS

A retrospective observational study was conducted in the Coffee Triangle region of Colombia, a central area of the country. The study included all patients with laboratory-confirmed SARS-CoV-2 infection who were either referred to or admitted to ICUs

**Table 1.** Clinical and demographic characteristics of patients diagnosed with COVID-19 in the Coffee Triangle, Colombia.

Characteristic	Average±ED	n=171 (100%)
Age	60±15	
BMI	27.31±4.67	
Sex	Men	109 (63.7)
	Women	62 (36.3)
High blood pressure		102 (59.6)
Diabetes mellitus		54 (31.6)
Smoking antecedent		38 (22.2)
Chronic obstructive pulmonary disease		33(19.3)
History of cardiovascular disease*		28 (16.3)
Chronic kidney disease		19 (11.1)
Coronary heart disease		18 (10.5)
Immunosuppression**		15 (8.77)
Cancer		11 (6.4)
Hypothyroidism		8 (4.67)
Active smoking		6 (3.5)
Charlson Comorbidity Index	0-1	26 (15.2)
	2	31 (18.1)
	>3	114 (66.6)

BMI: Body Mass Index

SD: standard deviation

\*\*Include (systemic lupus erythematosus, rheumatoid arthritis, myasthenia gravis), HIV, and transplants.

\*Include heart failure, heart valve disease, and arrhythmias.

in three hospitals between December 1, 2020, and January 1, 2021. SARS-CoV-2 infection was confirmed using real-time reverse transcriptase-polymerase chain reaction (RT-PCR) tests performed on nasopharyngeal swabs, following WHO guidelines and protocols established by Colombia's National Health Institute.

This study was approved by the ethics review board of Universidad Tecnológica de Pereira and the ethics committees of the participating hospitals. It was classified as minimal-risk research according to Resolution 8430 of 1993 and the Declaration of Helsinki.

## Data Collection

Data were collected from clinical records of ICU-admitted patients with laboratory-confirmed SARS-CoV-2 infection. Variables extracted included age, sex, comorbidities, respiratory support type (invasive and non-invasive mechanical ventilation),

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**Table 2.** Initial symptoms reported upon admission.

Symptoms	n=171 (100%)
Dyspnoea	155 (90.6)
General malaise	142 (83)
Cough	126 (73.7)
Fever	98 (57.3)
Diarrhoea	24 (14)
Neurological and/or psychiatric manifestations**	17 (10)
Anosmia/Ageusia	16 (9.35)
Chest pain	12 (7)
Expectoration	11 (6.4)
Headache	10 (5.8)
Hyporexia	9 (5.26)
Nausea and vomiting	7 (4.1)
Odynophagia	5 (2.9)
Rhinorrhoea	6 (3.5)
Abdominal pain	4 (2.3)
Diaphoresis and/or chills	2 (1.2)
Peripheral oedema	2 (1.2)
Upper gastrointestinal bleeding	2 (1.2)
Low back pain	2 (1.2)

\*\*Includes focal neurologic deficit, seizures, syncope, dizziness, and agitation.

**Table 3.** Time between onset of symptoms and hospital admission, and severity scales.

Days from symptomatic state to hospital admission Mean±ED	N=171 (100%)
0	21 (12.28)
1	128 (74.85)
2	22 (12.86)
3	0 (0)
1-4	25 (14.6)
NEWS SCORE	
5-6	22 (12.9)
7 or >	124 (72.5)

SD: standard deviation

**Table 4.** Vital signs at patient's hospital admission.

Vital sign	Mean±DE
Respiratory rate	28±10
Heart rate	90 ± 20
Systolic blood pressure	131±29
Diastolic blood pressure	79±54
Mean arterial pressure	94±20
Temperature	37±6
Oxygen saturation	87±10

SD: standard deviation

fraction of inspired oxygen (FiO<sub>2</sub>) ratio, and physiological parameters such as body mass index (BMI), mean arterial pressure, heart rate, oxygen saturation, and mental status upon hospital admission. The Charlson comorbidity index was calculated.

Diagnostic evaluations included laboratory tests (complete blood count, creatinine, bilirubin, transaminases, lactate dehydrogenase, C-reactive protein, ferritin, D-dimer, blood urea nitrogen, troponin I) and imaging studies (chest X-ray, chest computed tomography). Radiographic abnormalities were documented based on radiologists' reports. Therapeutic interventions assessed included systemic corticosteroids, antibiotics, vasopressors, sedatives, neuromuscular blockers, prone positioning, renal replacement therapy, anticoagulation, and ventilatory support. Disease severity was evaluated using the APACHE II, NEWS 2, and SOFA scores. Clinical outcomes included acute cardiac injury, acute kidney injury, acute respiratory distress syndrome (ARDS), acidosis, coagulopathy, delirium, heart failure, sepsis, shock, tracheostomy requirement, and extubation failure.

### Statistical Analysis

Data were analyzed using EPIDAT software (4.2 version). Categorical variables were presented as frequencies and proportions, while continuous variables were reported as medians and interquartile ranges (IQR) with 95% confidence intervals (CIs).

The chi-square test was used to compare categorical variables, considering in-hospital mortality as the primary outcome. A Student's t-test was applied for normally distributed variables, and a Mann-Whitney U test was used for non-normally distributed variables.

## RESULTS

### Clinical and Demographic Characteristics

A total of 171 patients with confirmed COVID-19 were admitted to three ICUs in the Coffee Triangle region between December 1, 2020, and January 1, 2021. The main results are summarized

**Table 5.** Imaging and laboratory characteristics of COVID-19 patients in intensive care units in the Coffee Triangle region, Colombia.

Characteristic	n=171 (100%)	Mean±ED
Imaging findings	Bilateral alveolar opacities	100 (58.5)
	Frosted glass opacities	70 (40.9)
	Pulmonary consolidation	23 (13.4)
	Pleural effusion	13 (7.6)
	Bilateral reticular opacities	2 (1.2)
	Atelectasis	1 (0.6)
	Cavitary lung lesion	1 (0.6)
Troponin	Test not performed	13 (7.6)
	Negative	100 (58.5)
	Positive	58 (34)
Ferritin		1163±802
D Dimer		4.99 ± 9.17
Leukocytes (absolute count)		12.43±3.97
Lymphocytes (absolute count)		400±0.24
Neutrophils (absolute count)		10.50±3.9
Haemoglobin (g/dL)		13.26±2
Platelets (absolute count)		275497±97643
Creatinine (mg/dL)		1.47±2
LDH (U/L)		561±294
pH		7.29±0.15
PaO <sub>2</sub>		68.9±30.6
PaCO <sub>2</sub>		33.8±11.9
HCO <sub>3</sub>		20.95±4
Base excess		-3.3±6.2
Lactate		2.67±2.33
PaO <sub>2</sub> /FIO <sub>2</sub> ratio		109.6±63.5
SD: standard deviation		
LDH: lactate dehydrogenase		
CPK: creatinine phosphokinase		
PaO <sub>2</sub> : partial pressure of Oxygen		
PaCO <sub>2</sub> : arterial partial pressure of carbon dioxide		
HCO <sub>3</sub> : serum bicarbonate		
PaO <sub>2</sub> /FIO <sub>2</sub> : oxygenation Index.		

in Table 1. The mean patient age was 60 years (SD ±15), with a male predominance (63.7%). The mean BMI was 27.31 kg/m<sup>2</sup>. The most prevalent comorbidities were hypertension (59.6%), type 2 diabetes mellitus (31.6%), and COPD (19.3%).

The Charlson comorbidity index was >3 in 66.6% of cases. The most common symptoms at ICU admission were dyspnea

(90.6%), general malaise (83%), cough (73.7%), and fever (57.3%). Symptoms typically began approximately seven days before admission. A qSOFA ≥2 was observed in 15.3% of patients, while 72.5% had a NEWS score ≥7 (Tables 2 and 3). Mean respiratory rate was 28±9 breaths per minute, mean arterial pressure was 90.7±21.5 mmHg, temperature was 36.9±1°C, and oxygen saturation was 85±16% (Table 4).

**Radiological and Laboratory Findings**

The most common radiological findings were diffuse bilateral alveolar opacities (58.5%) and ground-glass opacities (40.9%). Delta troponin I was elevated in 34% of patients, indicating cardiac involvement. Markers of disease severity included ferritin (1163 ng/mL), D-dimer (4.99 mg/mL), and lactate dehydrogenase (561 U/mL). The mean PaO<sub>2</sub>/FiO<sub>2</sub> ratio at admission was 109 mmHg (Table 5).

**Clinical Outcomes**

APACHE II and SOFA scores at 24 hours post-admission were 14 and 4, respectively. The primary reason for ICU admission was respiratory failure (98.5%), followed by ARDS (83%) and septic shock (33.9%). Mean ICU stay was 13 days. Acute kidney injury occurred in 41% of cases, with 25% experiencing delirium. The in-hospital mortality rate was 69% (Table 6).

**Treatment and Complications**

Broad-spectrum antibiotics were administered to 73% of patients, though bacterial superinfection was confirmed in only 52.05% through microbiological testing. Gram-negative bacteria were predominant (74.15%), with *Klebsiella pneumoniae* being the most frequently isolated pathogen. Dexamethasone was used in 97.7% of patients, while 89.5% received anticoagulation. Invasive mechanical ventilation was required in 87.1% of cases, with a mean duration of 13±7 days. Prone positioning was utilized in 83.6% of patients, with ≤4 cycles in 52.6% (Table 7).

**DISCUSSION**

This study describes the clinical characteristics and outcomes of a group of patients with COVID-19 infection who were admitted to the ICU. It is the first characterisation of critical COVID-19 patients in the Coffee Triangle region in Colombia, although other studies have been published on Colombian patients.<sup>5,9,10</sup> According to other studies the highest proportion of cases are among males. Similarly, the participants in this study were an average of 60 years of age, which is also close to that recorded elsewhere in the literature, since it is this age group which develops a critical state of the disease.<sup>9,10</sup> It is interesting, however, that only 25% of the patients in our research had a BMI in the range of overweight and obesity, which is low compared to other studies. The proportion of patients with chronic respiratory disease, and a history of metabolic or renal disease were also low compared with other studies.<sup>11</sup>

On the other hand, half the patients had a history of arterial hypertension, which is congruent with the literature, and has been previously described as a critical factor in the development of severe disease.<sup>12</sup> Patients presented polypnea with 28 breaths per

**Table 6.** Length of stay and clinical outcomes of COVID-19 patients in the Coffee Triangle region, Colombia.

		Mean±SD	
Admission to ICU	n=171(100%)	Length of stay in ICU	13.96±9.8
		Days of hospital stay	18.27±13.28
APACHE II		14.74±5.8	
SOFA score		4.53±5.8	
NEWS 2 score		7.77±2.9	
In-hospital death		118 (69)	
Respiratory insufficiency		64 (98.5)	
ARDS		159 (93.0)	
Septic shock		58 (33.9)	
Pulmonary embolism		21 (12.3)	
Coagulopathy		15 (8.8)	
Acute heart injury		32 (18.7)	
Acute kidney injury with RRT		21 (12.3)	
Acute kidney injury without RRT		71 (41.5)	
Delirium		43 (25.1)	
Need for tracheostomy	<15 days after intubation.	8(26.7)	
	>15 days after intubation	22(73.3)	
Failed extubation with the necessity of re-intubation		15 (8.7)	
SD: standard deviation			
ICU: intensive care unit			
APACHE II: Acute Physiology and Chronic Health disease Classification System II			
SOFA: Sequential Organ Failure Assessment; NEWS: National Early Warning Score			
ARDS: acute respiratory distress syndrome			
RRT: renal replacement therapy			

minute on average, and severe hypoxemia with 87% of saturation on average, and high-flow oxygen administration compared

**Table 7.** Treatment of COVID-19 patients in the Coffee Triangle region, Colombia.

		n=171(100%)	Mean±ED
Superinfection	Clinical criteria		107 (62.57)
	Confirmed*		89 (52.05)
Isolated germs	Gram-positive		19 (21.3)
	Gram-negative		66 (74.15)
	Fungus		4 (4.4)
Antibiotic use		125 (73.1)	
Corticosteroids use		167 (97.7)	
	Dexamethasone		132 (77.2)
	Dexamethasone + Prednisone /Methylprednisolone		12 (7)
	Dexamethasone + Hydrocortisone		21 (12.3)
Invasive mechanical ventilation (IMV)	Use of 3/+ corticosteroids		2 (1.2)
	Yes		149 (87.1)
	Days of IMV		13±7
Failed extubation	Tidal volume (mL/Kg)		7.25±1.75
	Yes		14 (8.2)
Prone positioning	Yes		143 (83.6)
	number of cycles		< 4 = 90 (52.6)
			>4 = 51 (29.8)
Muscle relaxant	Yes		124 (72.5)
Vasopressors use	Yes		134 (78.4)
Renal replacement therapy	Yes		8 (12.3)
Anticoagulation	Yes		153 (89.5)

SD: standard deviation

\*Confirmed by blood culture, tracheal secretion culture, or film array

with other studies.<sup>13</sup> The most common symptoms were cough, dyspnoea, and fever, which is consistent with symptoms reported in Chile and Cuba.<sup>14,15</sup> On average, patients progressed to severe illness in seven days, and of course required hospital admission, but evidence of severity was not presented in the majority of cases, using either qSOFA or CURB-65.<sup>2</sup>

The highest proportion of imaging and laboratory findings were alveolar opacities and ground-glass infiltrates, which is similar to the findings by Acosta et al, in Peruvian patients, and Cattelan et al, in Italy.<sup>16,17</sup> 34% of patients in our study presented positive troponin, and also D-dimer, LDH, and elevated ferritin, which have been reported in several studies around the world as markers of severity and worse prognosis in COVID-19.<sup>18</sup> Severe hypoxemia was documented through arterial blood gas measurement that reported the oxygenation index (PaO<sub>2</sub>/FiO<sub>2</sub>) at an average of 109 mmHg, as found in the initial description of the critical disease by

COVID-19.<sup>1,13</sup> All patients had an extended stay in the ICU, with an average of 13 days and an average hospital stay of 18 days,<sup>19</sup> with an in-hospital mortality of 69% which is high compared to the results published by Cattelan *et al.*<sup>17</sup>

The most frequent complication was acute respiratory distress syndrome (ARDS), followed by septic shock and acute kidney injury, which have been discussed in various systematic reviews as common complications of critical disease following infection by SARS-CoV2.<sup>20,21</sup> Bacterial superinfection and coinfection occurred in 73% of cases, however bacterial superinfection was only confirmed by positive cultures and molecular diagnosis in 52% of cases.<sup>22</sup> Prescribing systemic steroids has become one of the pillars of management for moderate and severe infection in COVID 19 according to the RECOVERY study.<sup>23</sup> This intervention is reflected in the Colombian consensus;<sup>24</sup> Similarly, 89.5% of patients received doses of anticoagulation with heparins, since

the majority had high levels on the D dimer test, and pulmonary thromboembolism was documented by imaging in 12.3% of patients. On average, the patients received 13 days of mechanical ventilation, and 83.6% of patients required management with pronation, which is also similarly reported in the literature:<sup>25</sup> four cycles were administered on average (52.6%). No study, however, has reported the behaviour of oxygenation indices concerning pronation cycles.<sup>26</sup>

This study has some limitations: it involved a small sample of patients, although they attended three hospitals, which impedes statistical inferences from clinical outcomes. This limitation is especially related to mortality and life support requirements, such as kidney replacement therapy or the need for tracheostomy, which are associated with more complications after discharge from critical care.

### CONCLUSIONS

Critical COVID-19 illness exhibits variations across populations, yet key clinical and epidemiological factors remain consistent. Generating region-specific data is crucial for optimizing treatment strategies and resource allocation to improve patient outcomes.

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