

## Demographic and clinical characteristics of patients with SARS-CoV-2 infection

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### Abstract

**Aim:** The SARS-CoV-2 pandemic has had a strong international and national impact. The Intensive Care Unit of the Dr. R.A. Calderón Guardia Hospital has received critically ill patients with COVID-19 since March 2020. The aim of this study was to describe the main clinical and evolution characteristics of this population.

**Methods:** This is a descriptive, observational study covering a 7-month period from March to September 2020. Information was taken from 2 ICU databases, one of which was designed for this purpose.

**Results:** Information was collected from 120 patients, 91 (76%) male with a mean age of 60 years, mean mortality was similar for men and women standing at 52%. The population was primarily overweight or obese with an average body mass index of 31.3.

Eighty-one patients (67.5%) required mechanical ventilation and 72 patients (60%) developed acute renal failure. Mechanical ventilation increased the risk of death by 14.7 times and renal injury by 10.6 times.

Approximately half of the patients developed at least one nosocomial infection.

**Conclusion:** Severe SARS-CoV-2 infection has a high morbidity and mortality burden and is frequently associated with increased ventilatory requirements and renal failure. The latter two conditions significantly increase the risk of death.


**Keywords:** Covid-19, Coronavirus Infections, pneumonia, mortality.

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#### Abbreviations:

SARS-CoV-2, Severe Acute Respiratory Syndrome due to Coronavirus type 2 COVID-19 coronavirus disease - 2019; ICU, Intensive Care Unit

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The pandemic is caused by type 2 coronaviruses SARS-CoV-2,<sup>1-3</sup> arrived in Costa Rica in March; reorganization of the hospital system, creating specialized units as one of the many important steps taken to deal with this infection.

At the Hospital Dr. Rafael Ángel Calderón Guardia, the Intensive Care Unit was divided into two units, one for patients without COVID-19 and another for the care of patients with COVID-19, which was named ICU-COVID. The latter unit began receiving patients in March 2020 and continues to do so to date.

It is important to report the clinical evolution and outcome of these critical patients because, apart from the large epidemiological studies, national health

records, or personal anecdotes, it allows us to show the clinical evolution of the fraction of the population most affected by the pandemic.

The purpose of this study is to describe the main clinical characteristics and the evolution of disease in this population during the first months of the pandemic.

## Methods

This is an observational study and descriptive study, patients admitted from March to September 2020 were included.

The information was recorded in 2 databases: the general database of patients admitted to the Intensive Care Unit and another database created *specifically* for patients admitted to the ICU-COVID

The databases include clinical and demographic information on the patients, including age, sex, past medical history, weight, height, body mass index, inpatient complications such as renal failure or nosocomial infections, as well as the need for ventilatory or renal support and its different modalities, and outcome.

A total of 120 patients were registered between March and September 2020. Statistical analysis was performed with the software SPSS v.21 (IBM corp., USA) and consisted of the use of statistical tools descriptive statistics such as frequency distributions, measures of central tendency and dispersion, to evaluate the association of variables with mortality, the relative risk and 95% confidence interval was used as a measure of association, and the Chi-square test to evaluate the significance of the association, a Student's t-test was used to compare quantitative variables. The level of significance chosen was 0.05.

This research was approved by the Scientific Ethical Committee of the Hospital Rafael Ángel Calderón Guardia- CCSS with protocol number CEC-04-2021.

## Results

Data were collected from 120 patients, all with a diagnosis confirmed by polymerase reaction test (PCR). In Tables 1 and 2 show the main demographic features of the patients.

**Table 1. Main characteristics of the population (n=120)**

Variables	n (%)
Men	91 (76)
Women	29 (24)
Average age	60 years
Age range	27 to 85 years
p 25	51years
P 50	61 years old
p 75	70 years
Pathological history	
Arterial hypertension	72 (60)
Diabetes mellitus	47 (39)
Active smoking	21 (17.5)
Asthma/PDCO	10 (7)
Asthma	10 (7)

**Table 2. Distribution of patients according to sex and discharge condition (n=120)**

Sex	Stable	Deceased	Total
Men	43 (48%)	48 (52%)	91
Women	14 (48%)	15 (52%)	029
Total	57 (48%)	63 (52%)	120

Table 3 describes the body mass index and its relationship with patient outcome.

**Table 3. Mean weight and body mass index of patients according to their outcome (n=120)**

Patients	Weight in kg	Body mass index
Stable	93.72	30.72
Deceased	88.23	31.91
Overall average	91	31.3

The mean age of patients who did not die was 55 years and that of those who died was 64 years; likewise, the mean age of patients with mechanical ventilation was 62 years, while the mean age of patients who did not require mechanical ventilation was 57 years ( $p > 0.05$ ).

Overall mortality was 52%, although this varied especially according to two conditions: the need for assisted mechanical ventilation and the presence of acute renal failure (see Tables 4 and 5). Mortality in patients with mechanical ventilation reached 75% what meant that the relative risk of death was 14.7 times higher if the patient required mechanical ventilation than if he or she did not (95% CI;3.8-57).

**Table 4. Distribution of patients using mechanical ventilation and condition of discharge (n= 120).**

Mechanical Ventilation	Stable	Deceased	Total
Yes	20 (25%)	61 (75%)	81
No	37 (95%)	2 (5%)	39
Total	57	63	120

Relative risk of death with AMV: 14.7 (95% CI; 3.8-57).

**Table 5. Distribution of patients according to the presence of acute presence of acute renal failure (ARF) and outcome (n=12)**

Acute renal failure	Alive	Deceased	Total
No	38 (79%)	10 (21%)	048
Yes	19 (26%)	53 (74%)	72
Total	57 (48%)	63 (53%)	120

Relative risk for death with ARF: 10.6 (95% CI; 4.4- 25.3)

Prone ventilation was performed at some time during their clinical evolution in 83 patients (69%) with an average of 52 total cumulative hours per patient in this modality. When ventilation in prone position lasted less than 18 hours, no major complications were detected and the best survival rate was obtained; between 19 and 36 hours the highest mortality rate was observed, and after 54 hours there was a discrete improvement in patient survival, although none of these findings reached the maximum survival rate. Duration of ventilation in pronation was associated with increased thrombotic complications (such as deep vein thrombosis or pulmonary embolism), renal injury, and delirium (see Table 6).

**Table 6. Complications associated with mechanical ventilation in pronation (n=120)**

Type of complication	No. of cases	Average hours	Value of p
Thrombotic	14	55.3	0.04
Renal injury	72	51.1	0.00
Delirium	41	57.3	0.00

On the other hand, 60% of the patients presented with acute renal failure during their admission which meant a relative risk of death 10.6 times higher than that of patients without renal failure (95% CI; 4.4- 25.3). A total of 33 patients (27.5 of the total enrolled patients) required some form of renal replacement therapy.

A total of 59 patients (49%) developed a nosocomial bacterial infection. Of these patients 47 (80%) had pneumonia and 28 (47%) patients had bacteremia, these being the two most frequent infections. Table 7 shows the most frequent bacterial isolates in these locations.

**Table 7. Germs and site of isolation of patients with nosocomial infections (n=120)**

Germ	Respiratory	Blood culture	Total
<i>Staphylococcus aureus</i>	12	5	17
<i>Coagulase-negative Staphylococcus</i>	4	2	6
<i>Staphylococcus epidermidis</i>	3	1	4
<i>Enterococcus faecalis</i>	3	4	7
<i>Klebsiella pneumoniae</i>	10	1	11
<i>Escherichia coli</i>	7	2	9
<i>Pseudomonas aeruginosa</i>	5	2	7

The development of nosocomial infections increased the risk of death by 1.9 times (95%CI; 1,457-2,729).

## Discussion

The findings of this research are congruent with the data published in the international literature, especially the predominance and greater severity in men than in women and the greater frequency of geriatric patients.<sup>5,6</sup>

As reported in some series,<sup>7</sup> smoking, asthma, and chronic obstructive pulmonary disease were not highly prevalent in patients hospitalized in critical condition. It would be necessary to contrast these data with the total number of patients with

COVID-19, but they do not seem to be risk factors of special importance for critically ill patients.

On the other hand, it is clear that obesity is a risk factor for hospital admission in general and for admission to Intensive Care for COVID-19 in particular.<sup>8,9</sup>

From the point of view of ventilatory mechanics, obesity is associated with a decrease in the expiratory reserve volume, functional capacity, and distensibility of the respiratory system. In patients with greater abdominal obesity, pulmonary function is more overloaded in the supine position due to decreased diaphragmatic excursion, which hinders ventilation. In addition, the increase in inflammatory cytokines associated with obesity could contribute to the increased obesity-associated morbidity in COVID-19 infections and their increased need for intervention in specialized units. However, it was striking that the deceased patients had on average a lower body mass index (BMI) than the deceased patients - while remaining obese - than that of the patients who did not die and even lower than the average for all patients.

For this series, invasive mechanical ventilation and renal failure became conspicuous risk factors associated with a fatal outcome. Tang *et al*<sup>10</sup> suggest the high mortality of mechanically ventilated patients may be due to a new pathogen, and therefore, it is from the experience gained with these early cases of COVID-19 that subsequent cases may benefit from improved therapies, including specific medical treatments and non-invasive respiratory support.

Prone ventilation has been shown to reduce the mortality rate in difficult-syndrome severe acute respiratory disease. Although it is a measure that is still used infrequently and considered a rescue maneuver. However, pronation therapy has experienced a recent resurgence and played a key role during the COVID-19 pandemic in our Intensive Care Unit. It is not a therapy free of complications both pulmonary (such as accidental extubating) and extra-pulmonary (such as pressure ulcers or increased intracranial pressure due to cerebral venous return). In our series, the main complications appeared after 50 cumulative hours of prone ventilation and may be related to mortality at this point; however, this should be the subject of further research.

Although initial reports from China reported a low incidence (5%-10%) of acute kidney injury,<sup>11</sup> later studies documented a much higher incidence in hospitalized patients. Follow-up study of hospitalized patients with COVID-19, Chan *et al*<sup>12</sup> reported that up to 46% of the patients developed acute renal failure and 19% required some form of renal replacement therapy.

Our series confirms that renal injury is a frequent complication in critically ill patients and that it is also associated with higher mortality, constituting a marker of poor prognosis. It is likely that our higher incidence of renal failure is due to a selection bias, since many units involved in the management of COVID-19 cannot provide renal replacement therapy and therefore it is often necessary to transfer patients requiring such therapy between units. However, it should be remembered that renal support is basically a palliative therapy that reduces morbidity and does not change mortality.

Our work is a retrospective study of SARS-CoV-2 infection in critically ill patients and aims to show a clear overall picture of this population. Some aspects merit further investigation beyond the scope of this article.

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## References

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1. Sohrabi C, Alsafi Z, O'Neill N, Khan M, Kerwan A, Al-Jabir A, et al. World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). Vol. 76, International Journal of Surgery. 2020.
2. Wu YC, Chen CS, Chan YJ. The outbreak of COVID-19: An overview. Vol. 83, Journal of the Chinese Medical Association. 2020.
3. Kannan S, Ali PSS, Sheeza A, Hemalatha K. COVID-19 (Novel Coronavirus 2019) - recent trends. Eur Rev Med Pharmacol Sci. 2020;24(4).
4. PRESIDENCIA DE LA REPUBLICA. Reforma Declara estado de emergencia nacional en todo el territorio de la República de Costa Rica, debido a la situación de emergencia sanitaria provocada por la enfermedad COVID-19 N° 42296-MP-S [Internet]. Diario Oficial La Gaceta; 2020. Available from: [http://www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm\\_texto\\_completo.aspx?param1=NRTC&nValor1=1&nValor2=91036&nValor3=120113&strTipM=TC](http://www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?param1=NRTC&nValor1=1&nValor2=91036&nValor3=120113&strTipM=TC)

5. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. Vol. 109, *Journal of Autoimmunity*. 2020.
6. Velavan TP, Meyer CG. The COVID-19 epidemic. Vol. 25, *Tropical Medicine and International Health*. 2020.
7. Bajgain KT, Badal S, Bajgain BB, Santana MJ. Prevalence of comorbidities among individuals with COVID-19: A rapid review of current literature. *Am J Infect Control* [Internet]. 2021;49(2):238–46. Available from: <https://doi.org/10.1016/j.ajic.2020.06.213>
8. Petrilli CM, Jones SA, Yang J, Rajagopalan H, O'Donnell L, Chernyak Y, et al. Factors associated with hospital admission and critical illness among 5279 people with coronavirus disease 2019 in New York City: Prospective cohort study. *BMJ*. 2020;369.
9. Busetto L, Bettini S, Fabris R, Serra R, Dal Pra C, Maffei P, et al. Obesity and COVID-19: An Italian Snapshot. *Obesity*. 2020;28(9):1600–5.
10. Tang X, Du RH, Wang R, Cao TZ, Guan LL, Yang CQ, et al. Comparison of Hospitalized Patients With ARDS Caused by COVID-19 and H1N1. *Chest*. 2020;158(1).
11. Chan L, Hindi J, Nadkarni GN. COVID-19: The Kidneys Tell a Tale. *Am J Kidney Dis* [Internet]. 2021;77(2):175–7. Available from: <https://doi.org/10.1053/j.ajkd.2020.11.001>
12. Chan L, Chaudhary K, Saha A, Chauhan K, Vaid A, Zhao S, et al. AKI in hospitalized patients with COVID-19. *J Am Soc Nephrol*. 2021;32(1):151–60.