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# BMJ Open

## Characteristics, Complications and Outcomes Among 1,549 Patients Hospitalized with COVID-19 in a Secondary Hospital.

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# Characteristics, Complications and Outcomes Among 1,549 Patients Hospitalized with COVID-19 in a Secondary Hospital

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**KEYWORDS:** COVID-19, secondary-level hospital, epidemiology.

## ABSTRACT

**Background:** The rapid global spread of COVID-19 has caused a public health emergency with major international repercussions. Information on patient profiles and outcomes in secondary hospitals is limited. We aimed to describe demographic, clinical, radiological and laboratory characteristics, as well as outcomes, of patients admitted for COVID-19 in a secondary hospital. **Methods:** Retrospective case series of sequentially hospitalized patients with confirmed SARS-CoV-2, at Infanta Leonor University Hospital in Madrid, Spain from the beginning of the outbreak until 28 May 2020. **Results:** A total of 1,549 COVID-19 cases were included (median age 69 [IQR 55.0- 81.0], 57.5% male). 78.2% had at least one underlying comorbidity, the most frequent was hypertension (55.8%). Most frequent symptoms at presentation were fever (75.3%), cough (65.7%) and dyspnea (58.1%). 81 patients were admitted to the intensive care unit (ICU) (median age 62 [IQR 51-71], 74.1% male). 1393 patients had an outcome at the end of the study period (case fatality ratio: 21.2% (296/1,393)). The independent factors associated with fatality (OR; 95% CI): age (1.07; 1.06-1.09), male sex (2.86; 1.85-4.50), neurological disease (1.93; 1.19-3.13), chronic kidney disease (2.83; 1.40-5.71) and neoplasia (4.29; 2.40-7.67). The percentage of hospital beds occupied with COVID-19 almost doubled (702/361), with the number of patients in ICU quadrupling its capacity (32/8). Median length of stay was 9 days (IQR 6-14). **Conclusions:** This study provides clinical characteristics, complications and outcomes of COVID-19 patients admitted to a European secondary hospital. Fatal outcomes were similar to those reported by hospitals with a higher level of complexity.

**STRENGTHS AND LIMITATIONS OF THIS STUDY**-This is a large retrospective case series study of 1549 sequentially hospitalized patients with confirmed SARS-CoV-2.

-The study describes the response of a secondary hospital based in a region of Spain with the highest incidence of COVID-19, and how the hospital was transformed into a center entirely dedicated to COVID-19.

-A complete follow-up was made of all patients during hospital stay, although after discharge no outcome information was collected, so only in-hospital fatality could be estimated.

## BACKGROUND

In December 2019, a novel coronavirus (severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2]) emerged in China and spread globally, causing a new infectious disease named “coronavirus disease 2019” (COVID-19) (1). By 28 May 2020, the epidemic reaches 5,593,631 confirmed cases and more than 353,334 deaths across 216 countries all over the world (2).

The first confirmed case of COVID-19 in Spain was reported from La Gomera (Canary Islands) on 31 January 2020 (3). But it was not until the last week of February 2020 when the first five cases were reported in the Community of Madrid (4).

During March and April 2020, Spain has been one of the most affected countries by the coronavirus, being one of the main outbreaks of the disease worldwide. Spain, with 237,906 cases as of 28 May 2020, is the third country in Europe with the highest number of confirmed cases after the Russian Federation and the United Kingdom (UK)

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3 (2,5). The rate of infections in the Community of Madrid has exceeded every other  
4 region in Spain, with more than 25% of all confirmed cases in Spain and an  
5 accumulated number of 41,972 hospitalized patients and 8,691 deaths as of 28 May  
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13 The Infanta Leonor University Hospital (ILUH) is a secondary level hospital with 361  
14 beds, including 8 in the intensive care unit (ICU). It serves the population of Vallecas  
15 (305,262 individuals) (6) Our healthcare area has a disproportionate number of  
16 inhabitants per bed (845 inhabitants/hospital bed and 38,150 inhabitants/ICU bed).  
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18 Vallecas is one of the COVID-19 most affected neighborhood in the city of Madrid  
19 (Spain) with 4,360 total confirmed COVID-19 cases as of 28 May 2020 (7). Therefore,  
20 the level of hospital saturation during the epidemy has been one of the greatest in  
21 Spain. As a consequence, the hospital was in March transformed into a center entirely  
22 dedicated to COVID-19 and all its professionals focused on assisting patients affected  
23 by the SARS-CoV-2 infection.  
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36 Limited information is available to describe characteristics, complications and mortality  
37 in COVID-19 overloaded secondary Spanish hospitals. The available data from Spain  
38 refer to tertiary hospitals, multi-centric studies or primary care settings (8–11).  
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44 This study describes the clinical characteristics, severity, types of treatments and  
45 overall outcomes of patients with confirmed SARS-CoV-2 infection admitted to ILUH  
46 in Madrid (Spain).  
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## METHODS

### Study design and participants:

A single-center retrospective observational study that included patients attended at ILUH with a laboratory-confirmed COVID-19 between 1 March 2020 and 28 May 2020. SARS-CoV-2 infection was confirmed by real-time reverse transcriptase–polymerase chain reaction (RT-PCR) assay from nasopharyngeal swabs. Patients discharged from the emergency department and those transferred to another hospital in the first 48 hours were not included in the final analysis.

Epidemiological and demographic data, medical history, baseline comorbidities, symptoms and signs both at admission and during follow-up, laboratory findings, RT-PCR results, treatment strategy used for COVID-19, complications and survival data were obtained from patient's electronic medical records. All-cause mortality was calculated including deaths occurred both in patients pending admission (first 48 hours) and during hospitalization. ICU admission, hospitalization length of stay and ventilatory support (invasive mechanical ventilation, noninvasive mechanical ventilation or oxygen mask) were also registered. Different time intervals were calculated: lag time between symptoms onset and diagnosis, length of stay at ICU and global length of stay at the hospital.

Data were collected and managed using REDCap electronic data capture tools hosted at Ideas for Health Association. REDCap (Research Electronic Data Capture) is a secure, web-based software platform designed to support data capture for research studies (12).

The STROBE statement guidelines were followed in the conduct and reporting of the study.

## Patient and Public Involvement

There was no patient or public involvement in the development of the research design or in conducting the study.

## Statistical Analysis:

A descriptive analysis of the clinical background and baseline characteristics of the patients was performed. Continuous variables are presented as median and interquartile range (IQR), after testing normal distribution. Categorical variables are expressed as number of patients and percentage. Two age-groups were defined using a cut off value of 65 (<65 and  $\geq$ 65 years old) for the comparison of the clinical characteristics of the cohort. For the ICU analysis, the comparison of the characteristics between admitted and non-admitted to ICU patients were limited to patients under 65 because of the uneven opportunities for ICU admission due to the scarce availability of ICU resources.

For the mortality analysis, the case fatality ratio (CFR) was defined as number of deaths of laboratory-confirmed COVID-19 patients divided by the number of laboratory-confirmed COVID-19 cases admitted to the hospital. The outcomes were defined as death or recovered, and the clinical characteristics between these groups were compared using Chi-square test for the categorical variables and Median test for the quantitative variables.

Logistic regression analysis was carried out to ascertain the effect of sociodemographic and clinical background characteristics on mortality. Variables that showed statistical significance in the univariate analysis and clinical variables that have potential relevance on the outcome according to the current available evidence

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3 were included in the model. Odds Ratio (OR) and 95% confidence intervals (95% CI)  
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5 were calculated.  
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8 Statistical analyses were done using Stata software (version 14.0; Stata Corporation,  
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10 College Station, Texas, USA).  
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### 13 **Ethical aspects:**

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16 The Institutional Investigation and Ethics Review Board of Infanta Leonor University  
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18 Hospital (CEI-ILUH) approved the study (Code ILUH R 027-20) and due to its  
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20 retrospective nature, the need for informed consent from patients was waived.  
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## 27 **RESULTS**

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30 Overall, 2,259 COVID-19 confirmed cases were attended at ILUH during the study  
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32 period. The daily number of confirmed COVID-19 cases are plotted by the date of  
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34 diagnosis (date of positive RT-PCR) and by the date of symptoms onset in **Figure 1**.  
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36 The first positive patient in our hospital was diagnosed on 1 March 2020 and the  
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38 epidemic curve peaked on 19 March when 126 PCR tested positive. From that date,  
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40 the incidence declined gradually but it took over a month to have a daily number of  
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42 new cases below 10. The percentage of ICU beds and total hospital beds occupied  
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44 with COVID-19 patients are shown in **Figure 1**. On 27 March, our hospital almost  
45  
46 doubled its bed capacity with 702 hospitalized patients. On 6 April, 32 patients were  
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48 in ICU, reaching 400% of hospital ICU capacity.  
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54 Among these 2,259 patients, we analyzed 1,549 cases and excluded 710 because  
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56 they were discharged from the emergency department or transferred to other hospitals  
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58 in the first 48 hours. For the complications, ICU and mortality analysis, 156 patients  
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3 with an uncomplete episode were excluded because they were transferred to other  
4 hospitals during their stay or were still hospitalized by 28 May 2020 (**Figure 2**).

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8 The median age of the 1,549 hospitalized patients was 69 (IQR 55.0-81.0) and 57.5%  
9 were male. All patients except for a three-week-old baby were adults. 55.0% had  
10 hypertension, 24.8% diabetes, 24.3% cardiovascular disease, 15.7% obesity, 13.7%  
11 chronic obstructive pulmonary disease (COPD) and 8.5% obstructive sleep apnea  
12 syndrome (OSAS). HIV infection (0.6%) and autoimmune disease (5.2%) were rare.  
13 Overall, 1,221 (78.2%) patients had at least one underlying comorbidity.  
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23 The median lag time between symptoms onset and diagnosis was 7 days (IQR: 4-9)  
24 (**Figure 1**). The commonest symptoms at presentation were fever (75.3%), cough  
25 (65.7%) and dyspnea (58.1%). Diarrhea (17.6%) and anosmia (3.6%) were less  
26 common in our case series. Fever, headache, cough, diarrhea, nausea/vomiting,  
27 anosmia, muscle or chest pain were more frequent in younger patients while cognitive  
28 deterioration was in older patients (**Table 1**).

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37 The most frequent therapies used for treating COVID-19 were the combination  
38 hydroxychloroquine plus azithromycin (59.9%) and the combination  
39 hydroxychloroquine plus azithromycin plus lopinavir-ritonavir (18.5%). Any treatment  
40 combination including lopinavir-ritonavir was more frequently used in older patients.  
41 Tocilizumab was used in 15.5% of the patients and corticosteroids in 44.2%. (**Table**  
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**1**).

52 The analysis of the complications during admission showed that 14.3% of patients had  
53 acute respiratory distress syndrome with no differences between age groups, 12.0%  
54 had acute kidney failure which was more frequent in older patients (15.7% vs. 6.7%),

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3 6.7% had a clinical thrombotic event and 0.7% had disseminated intravascular  
4 coagulation (**Table 1**).

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8 Among patients with a complete episode at ILUH, 81 were admitted to ICU: median  
9 age 62 (IQR 51-71) and 74.1% male. Clinical characteristics are shown in **Table 2**.

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11 Among the 575 patients younger than 65 years old with a complete episode at ILUH,  
12 risk factors associated to ICU admission in the univariate analysis were: being male,  
13 obesity, hypertension, OSAS, having an increased respiratory rate, a low blood  
14 oxygen saturation level (SpO<sub>2</sub>) at admission, a high neutrophil/lymphocyte ratio, an  
15 elevated plasma INR, lactate dehydrogenase (LDH), aspartate transaminase (AST),  
16 creatinine and C-reactive protein and the presence of alveolar pulmonary infiltrates in  
17 the chest x-ray. (**Table 2**). We calculated CFR in ICU patients with a complete episode  
18 at ILUH (70 patients): global CFR was 72.9% (62.8% in the under 65 group and 88.9%  
19 in the older group).

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34 The overall CFR in our cohort was 21.2% (296/1,393 cases). The median length of  
35 stay was 9 days (IQR 6-14). Among the 296 deaths, 48 occurred in the first 48 hours  
36 and the rest during hospitalization. These 48 patients had a higher median age  
37 compared to the global cohort (82.5 vs 69) and their median lag time from symptom  
38 onset until fatality was lower (7 days vs 13.5 days,  $p < 0.001$ ). As shown in **Table 3**,  
39 patients who died were older and more likely to be male, current smoker/ex-smoker,  
40 and had hypertension, cardiovascular disease, COPD, OSAS, diabetes mellitus,  
41 neurological disease, chronic kidney disease and neoplasia in the univariate analysis.  
42 Also, they received more frequently ventilatory support during hospitalization and  
43 showed more alveolar pulmonary infiltrates in chest x-ray than people who recovered.  
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3 In the multivariate analysis, independent factors related to death were: years of age  
4 (OR 1.07; 95% CI: 1.06-1.09), being male (OR 2.86; 95% CI: 1.85-4.50), neurological  
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6 disease (OR 1.93; 95% CI: 1.19-3.13), chronic kidney disease (OR 2.83; 95% CI: 1.40-  
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8 5.71) and neoplasia (OR 4.29; 95% CI: 2.40-7.67).  
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13 Among the 1,549 hospitalized patients, 65 were readmitted (4.2%): 64.6% were male  
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15 and 67.7% were 65 years old or older. CFR during readmissions was 10.8% (7/65).  
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## 17 18 **DISCUSSION**

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21 This study describes the COVID-19 series of a secondary level hospital in Madrid,  
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23 Spain. Patients baseline characteristics are similar to the largest published series in  
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25 Spain (9), although our patients were older and with a higher proportion of males  
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27 compared to other tertiary Spanish hospital series (8).  
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31 We found that younger patients showed a high incidence of fever, cough, headache,  
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33 muscle pain and diarrhea, whereas older patients showed a less specific clinical  
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35 presentation. Other studies did not find differences in clinical presentation related to  
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37 age (13). This information could be crucial for the rapid identification and isolation of  
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39 the suspected cases at any healthcare level.  
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43 Our cohort showed a high incidence of acute kidney failure during hospitalization  
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45 similar to other non-Spanish series (14,15) but higher than other Madrid series (8),  
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47 with no association to drug administration. This could be explained for the rapid  
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49 hydroelectrolytic imbalance in older patients in the context of an acute systemic viral  
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51 disease. We also found a high incidence of thrombotic events (6.7%) comparable to  
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53 previous reports (16), although disseminated intravascular coagulation was rare.  
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57 Lopinavir/ritonavir-based treatments were more frequently used in older patients. This  
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59 finding is due to the use of this drug as standard treatment in our hospital protocol  
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3 during the first half of the outbreak, when most of the patients were older than 65.  
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5 Tocilizumab, with or without corticosteroids, was used following Spanish Drug Agency  
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7 recommendations in patients who developed cytokine release storm (CRS) which is  
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9 believed to cause acute respiratory distress syndrome (ARDS), although  
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11 corticosteroids were also used in others clinical contexts.  
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16 Our findings in the ICU analysis in patients under 65 years old were analogous to other  
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18 studies (15,17,18) in terms of clinical characteristics and laboratory values. As  
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20 described in the New York series (15), it seems that obesity and OSAS were related  
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22 factors leading to ICU admission, even more than the presence of a previous  
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24 pulmonary disease. This could suggest that patients with a baseline ventilatory  
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26 compromise could entail a higher risk for ICU admission due to alveolar  
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28 hypoventilation and acute-on-chronic hypercapnic respiratory failure. However, this  
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30 analysis has some limitations related to scarce availability of ICU resources in our  
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32 center and the number of ICU patients who were transferred to other hospitals.  
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37 The CFR in our series was 21.2%. It has probably been overestimated due to a  
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39 significant proportion of patients transferred to other hospitals in the first 48 hours, who  
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41 had a less severe disease. Some published series showed a lower CFR (19), although  
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43 others reported a similar (8,9,15) or even higher CFR (14,20). The differences could  
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45 be related to demographic factors, different hospital admission criteria, case definition  
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47 and healthcare system overload level (21). It is interesting to note that the CFR found  
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49 in our study is similar to other Spanish tertiary level hospitals (8), despite our sample  
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51 had a higher proportion of older and male patients and our center had a lower  
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53 proportion of conventional hospitalization and ICU beds availability. The CFR in our  
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55 UCI is slightly lower than other studies (15).  
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3 Comparing the patients who died in the first 48 hours (48/296) with the rest of the  
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5 deceased, the median age was higher and the median days from symptom onset until  
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7 fatality was lower. This could reflect a steep clinical deterioration in older patients  
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9 compared to younger patients. Further studies are required to support the evidence of  
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11 a severe clinical phenotype of SARS-CoV-2 infection characterized by a quick  
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13 progression of an acute respiratory failure with severe hypoxemia in older patients that  
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15 leads to fatal outcome.  
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19 We found similarities with other series (22) about variables associated to fatality in the  
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21 univariate analysis, such as hypertension, cardiovascular disease or pulmonary  
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23 diseases. Nevertheless, after adjusting by sociodemographic variables and  
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25 comorbidities at admission, risk factors related to death were age, male gender,  
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27 neurological disease, chronic kidney disease and cancer. These findings are  
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29 consistent with other studies that identify male sex and age as important predictors for  
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31 mortality (23). However, this analysis has some limitations because it only focuses in  
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33 hospitalized patients skewing estimates of the morbi-mortality and risk factors of  
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35 COVID-19 globally (10).  
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41 The strength of this study lies on the sequential collection of patients (all COVID-19  
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43 patients admitted to hospital were included) and on the complete follow-up of all  
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45 patients during their entire hospital stay. On the other hand, it also has some  
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47 limitations. First, its observational and retrospective nature. Second, some variables  
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49 (i.e. anosmia and history of thromboembolic event) have a relatively large number of  
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51 missing values because they were not registered from the beginning of the study, due  
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53 to changes in the evidence related to COVID-19 during the progression of the  
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55 pandemic. Third, there is no follow-up after hospital discharge, so only in-hospital  
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57 fatality can be estimated.  
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## CONCLUSION

This study describes the epidemic progression, clinical characteristics, complications and outcomes of COVID-19 patients attended in a secondary level hospital in one of the highest COVID-19 incidence neighborhoods of Madrid, which turned into an entire COVID center and almost doubled its bed capacity. Fatal outcomes were similar to those reported by hospitals with a higher level of complexity.

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## FOOTNOTES

- **Contributors:** EJ, MFV, JV, IFJ, PR and MPB conceived the study idea. EJ, MFV, JV, IFJ, PR, MPB, EAA, EIG and AL contributed to the study design. EJ, MFV, IFJ, PR, EAA, EIG, AL and EG performed the data collection. MFV and EJ performed the analysis. EJ, MFV, JV, IFJ, PR, MPB, EAA, EIG and AL drafted the first version of the manuscript. All authors critically reviewed the manuscript and approved the final version.
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- **Competing interests:** none to declare.
- **Patient consent for publication:** Not required.
- **Ethics approval:** The Institutional Review Board of Infanta Leonor University Hospital approved this study (Code ILUH R 027-20)) and due to the retrospective nature, they waived the need for informed consent from patients.
- **Reporting guidelines:** The STROBE statement guidelines were followed in the conduct and reporting of the study.
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## REFERENCES

- 1  
2  
3 1. Gorbalenya AE, Baker SC, Baric RS, de Groot RJ, Drosten C, Gulyaeva AA, et  
4  
5 al. The species Severe acute respiratory syndrome-related coronavirus:  
6  
7 classifying 2019-nCoV and naming it SARS-CoV-2. *Nat Microbiol.*  
8  
9 2020;5(4):536–44.  
10  
11
- 12  
13 2. World Health Organization (WHO). Coronavirus disease (COVID-19) Situation  
14  
15 Report-129. Available at: [https://www.who.int/docs/default-](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200528-covid-19-sitrep-129.pdf?sfvrsn=5b154880_2)  
16  
17 [source/coronaviruse/situation-reports/20200528-covid-19-sitrep-](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200528-covid-19-sitrep-129.pdf?sfvrsn=5b154880_2)  
18  
19 [129.pdf?sfvrsn=5b154880\\_2](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200528-covid-19-sitrep-129.pdf?sfvrsn=5b154880_2) Accessed 31 May 2020.  
20  
21
- 22  
23 3. World Health Organization (WHO). Novel Coronavirus (2019-nCoV) Situation  
24  
25 Report 12. Available at: [https://www.who.int/docs/default-](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200201-sitrep-12-ncov.pdf?sfvrsn=273c5d35_2)  
26  
27 [source/coronaviruse/situation-reports/20200201-sitrep-12-](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200201-sitrep-12-ncov.pdf?sfvrsn=273c5d35_2)  
28  
29 [ncov.pdf?sfvrsn=273c5d35\\_2](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200201-sitrep-12-ncov.pdf?sfvrsn=273c5d35_2). Accessed 02 May 2020.  
30  
31
- 32  
33 4. Ministerio de Sanidad. Gobierno de España. Análisis epidemiológico COVID  
34  
35 19 . España. Available at:  
36  
37 [https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nC](https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov-China/situacionActual.htm)  
38  
39 [ov-China/situacionActual.htm](https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov-China/situacionActual.htm) Accessed 02 May 2020.  
40  
41
- 42  
43 5. Ministerio de Sanidad. Centro de Coordinación de Alertas y Emergencias  
44  
45 Sanitarias. Actualización no 119. Enfermedad por el coronavirus (COVID-19).  
46  
47 28.05.2020. Available at:  
48  
49 [https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasActual/](https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasActual/nCov-China/documentos/Actualizacion_119_COVID-19.pdf)  
50  
51 [nCov-China/documentos/Actualizacion\\_119\\_COVID-19.pdf](https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasActual/nCov-China/documentos/Actualizacion_119_COVID-19.pdf) Accessed 6 June  
52  
53 2020.  
54  
55
- 56  
57 6. Comunidad de Madrid. Hospital Universitario Infanta Leonor. Memoria 2018  
58  
59 Available at:  
60

- 1  
2  
3 <https://www.comunidad.madrid/sites/default/files/doc/sanidad/memo/hosp->  
4 [memoria-2018-hinfantaleonor\\_ok.pdf](https://www.comunidad.madrid/sites/default/files/doc/sanidad/memo/hosp-) Access 07 June 2020.  
5  
6  
7  
8  
9 7. Comunidad de Madrid. Transparencia. Covid-19-TIA por municipios y distritos  
10 de Madrid. Available at:  
11  
12 [https://datos.comunidad.madrid/catalogo/dataset/covid19\\_tia\\_muni\\_y\\_distritos](https://datos.comunidad.madrid/catalogo/dataset/covid19_tia_muni_y_distritos)  
13  
14 Accessed 01 June 2020.  
15  
16  
17  
18 8. Borobia A, Carcas A, Arnalich F, Álvarez-Sala R, Monserrat-Villatoro J,  
19 Quintana M, et al. A Cohort of Patients with COVID-19 in a Major Teaching  
20 Hospital in Europe. *J Clin Med* [Internet]. 2020 Jun 4 [cited 2020 Jun  
21 6];9(6):1733. Available from: <https://www.mdpi.com/2077-0383/9/6/1733>  
22  
23  
24  
25  
26  
27  
28 9. Casas Rojo JM, Antón Santos JM, Millán Núñez-Cortés J, Lumbreras Bermejo  
29 C, Ramos Rincón JM, Roy-Vallejo E, et al. Clinical characteristics of patients  
30 hospitalized with COVID-19 in Spain: results from the SEMI-COVID-19  
31 Network. *medRxiv* [Internet]. 2020 Jan 1;2020.05.24.20111971. Available  
32 from:  
33 <http://medrxiv.org/content/early/2020/05/26/2020.05.24.20111971.abstract>  
34  
35  
36  
37  
38  
39  
40  
41  
42 10. Prieto-Alhambra D, Ballo E, Coma-Redon E, Mora N, Aragon M, Prats-Urbe  
43 A, et al. Hospitalization and 30-day fatality in 121,263 COVID-19 outpatient  
44 cases. *medRxiv* [Internet]. 2020 Jan 1;2020.05.04.20090050. Available from:  
45 <http://medrxiv.org/content/early/2020/05/08/2020.05.04.20090050.abstract>  
46  
47  
48  
49  
50  
51  
52 11. Heili-Frades S, Minguez P, Mahillo-Fernandez I, Prieto-Rumeau T, Herrero  
53 Gonzalez A, de la Fuente L, et al. COVID-19 Outcomes in 4712 consecutively  
54 confirmed SARS-CoV2 cases in the city of Madrid. *medRxiv* [Internet]. 2020  
55 Jan 1;2020.05.22.20109850. Available from:  
56  
57  
58  
59  
60

- 1  
2  
3 <http://medrxiv.org/content/early/2020/05/25/2020.05.22.20109850.abstract>  
4  
5
- 6 12. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research  
7  
8 electronic data capture (REDCap)-A metadata-driven methodology and  
9  
10 workflow process for providing translational research informatics support. *J*  
11  
12 *Biomed Inform* [Internet]. 2009;42(2):377–81. Available from:  
13  
14 <http://dx.doi.org/10.1016/j.jbi.2008.08.010>  
15  
16
- 17  
18 13. Garg S, Kim L, Whitaker M, Cummings C, Holstein R, Prill M, et al. MMWR -  
19  
20 Hospitalization Rates and Characteristics of Patients Hospitalized with  
21  
22 Laboratory-Confirmed Coronavirus Disease 2019 — COVID-NET, 14 States,  
23  
24 March 1–30, 2020 [Internet]. 2019. Available from:  
25  
26 <https://www.cdc.gov/coronavirus/2019-ncov/>  
27  
28
- 29  
30 14. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors  
31  
32 for mortality of adult inpatients with COVID-19 in Wuhan, China: a  
33  
34 retrospective cohort study. *Lancet* [Internet]. 2020;6736(20):1–9. Available  
35  
36 from: [http://dx.doi.org/10.1016/S0140-6736\(20\)30566-3](http://dx.doi.org/10.1016/S0140-6736(20)30566-3)  
37  
38
- 39  
40 15. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson  
41  
42 KW, et al. Presenting Characteristics, Comorbidities, and Outcomes Among  
43  
44 5700 Patients Hospitalized With COVID-19 in the New York City Area. *JAMA*  
45  
46 [Internet]. 2020 Apr 22; Available from:  
47  
48 <https://jamanetwork.com/journals/jama/fullarticle/2765184>  
49  
50
- 51  
52 16. Lodigiani C, Iapichino G, Carenzo L, Cecconi M, Ferrazzi P, Sebastian T, et al.  
53  
54 Venous and arterial thromboembolic complications in COVID-19 patients  
55  
56 admitted to an academic hospital in Milan, Italy. *Thromb Res* [Internet]. 2020  
57  
58 Apr 23;191:9–14. Available from: <https://pubmed.ncbi.nlm.nih.gov/32353746>  
59  
60

- 1  
2  
3 17. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical Characteristics of  
4  
5 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia  
6  
7 in Wuhan, China. JAMA [Internet]. 2020 Mar 17 [cited 2020 Jun  
8  
9 6];323(11):1061. Available from:  
10  
11 <https://jamanetwork.com/journals/jama/fullarticle/2761044>  
12  
13
- 14  
15 18. Grasselli G, Zangrillo A, Zanella A, Antonelli M, Cabrini L, Castelli A, et al.  
16  
17 Baseline Characteristics and Outcomes of 1591 Patients Infected With SARS-  
18  
19 CoV-2 Admitted to ICUs of the Lombardy Region, Italy. Jama [Internet].  
20  
21 2020;1–8. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/32250385>  
22  
23
- 24  
25 19. Gold JAW, Wong KK, Szablewski CM, Patel PR, Rossow J, Silva J, et al.  
26  
27 Characteristics and clinical outcomes of adult patients hospitalized with  
28  
29 COVID-19 — Georgia, March 2020. Morb Mortal Wkly Rpt. 2020;69(18):1–6.  
30  
31
- 32  
33 20. Docherty AB, Harrison EM, Green CA, Hardwick HE, Pius R, Norman L, et al.  
34  
35 Features of 16,749 hospitalised UK patients with COVID-19 using the ISARIC  
36  
37 WHO Clinical Characterisation Protocol. medRxiv [Internet]. 2020 Jan  
38  
39 1;2020.04.23.20076042. Available from:  
40  
41 <http://medrxiv.org/content/early/2020/04/28/2020.04.23.20076042.abstract>  
42  
43
- 44  
45 21. Liang WH, Guan WJ, Li CC, Li YM, Liang HR, Zhao Y, et al. Clinical  
46  
47 characteristics and outcomes of hospitalised patients with COVID-19 treated in  
48  
49 Hubei (epicenter) and outside Hubei (non-epicenter): A Nationwide Analysis of  
50  
51 China. Eur Respir J. 2020 Apr 8;  
52
- 53  
54 22. Chen T, Wu D, Chen H, Yan W, Yang D, Chen G, et al. Clinical characteristics  
55  
56 of 113 deceased patients with coronavirus disease 2019: retrospective study.  
57  
58 BMJ [Internet]. 2020;368(December 2019):m1091. Available from:  
59  
60

1  
2  
3 <http://dx.doi.org/doi:10.1136/bmj.m1091>  
4  
5

- 6 23. Williamson E, Walker AJ, Bhaskaran KJ, Bacon S, Bates C, Morton CE, et al.  
7  
8 OpenSAFELY: factors associated with COVID-19-related hospital death in the  
9  
10 linked electronic health records of 17 million adult NHS patients. medRxiv  
11  
12 [Internet]. 2020 Jan 1;2020.05.06.20092999. Available from:  
13  
14 <http://medrxiv.org/content/early/2020/05/07/2020.05.06.20092999.abstract>  
15  
16  
17  
18  
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Table 1. Clinical characteristics and treatment (N= 1549)

	Global n/N (%)	< 65 y.o. n/N (%)	≥ 65 y.o. n/N (%)	p-value
Male	890/1549 (57.5)	400/642 (62.3)	490/907 (54.0)	0.001
Migrant	385/1549 (24.8)	296/642 (46.1)	89/642 (13.9)	<0.001
<b>Clinical background</b>				
Influenza vaccine 19/20	498/1101 (45.2)	90/463 (19.4)	408/638 (63.9)	<0.001
Cardiological disease	375/1545 (24.3)	37/640 (5.8)	338/905 (37.3)	<0.001
High blood pressure	851/1548 (55.0)	185/641 (28.9)	666/907 (73.4)	<0.001
Diabetes mellitus	382/1541 (24.8)	85/636 (13.4)	297/905 (32.8)	<0.001
Tobacco smoker/ex-smoker	374/1344 (27.8)	121/555 (21.8)	253/789 (32.0)	<0.001
Obesity	240/1531 (15.7)	110/636 (17.3)	130/895 (14.5)	0.129
COPD	211/1541 (13.7)	37/638 (5.8)	174/903 (19.3)	<0.001
Asthma	122/1545 (7.9)	51/639 (8.0)	71/906 (7.8)	0.668
OSAS	79/935 (8.4)	32/401 (8.0)	47/534 (8.8)	0.654
Cerebrovascular disease	57/125 (45.6)	12/28 (42.7)	45/97 (46.4)	0.741
Thromboembolic disease	41/939 (4.4)	10/410 (2.4)	31/529 (5.9)	0.011
Neurological disease	178/1540 (11.6)	37/637 (5.8)	141/903 (15.6)	<0.001
Chronic kidney disease	104/1543 (6.7)	16/639 (2.5)	88/904 (9.7)	<0.001
Cirrhosis	28/1540 (1.8)	13/638 (2.0)	15/902 (1.7)	0.209
Haematological/oncological cancer	103/1540 (6.7)	21/640 (3.3)	82/900 (9.1)	<0.001
HIV	9/1542 (0.6)	7/639 (1.1)	2/903 (0.2)	0.012
Autoimmune disease	47/913 (5.1)	17/393 (4.3)	30/520 (5.8)	0.328
<b>Symptoms</b>				
Fever	1159/1540 (75.3)	533/638 (83.5)	626/902 (69.4)	<0.001
Headache	133/1533 (8.7)	92/634 (14.5)	41/899 (4.6)	<0.001
Malaise	671/1533 (43.8)	282/637 (44.3)	389/896 (43.3)	0.928
Confused	87/1532 (5.7)	11/633 (1.7)	76/899 (8.4)	<0.001
Dyspnea	891/1533 (58.1)	362/632 (57.3)	529/901 (58.7)	0.382
Superior respiratory tract symptoms	316/1534 (20.6)	153/635 (24.1)	163/899 (18.1)	0.009
Cough	1010/1538 (65.7)	469/638 (73.5)	541/900 (60.1)	<0.001
Expectoration	194/1535 (12.6)	69/635 (10.9)	125/900 (13.9)	0.167
Hemoptysis	26/1532 (1.7)	15/633 (2.3)	11/899 (1.2)	0.207
Chest pain	134/1534 (8.7)	79/635 (12.4)	55/899 (6.1)	<0.001
Muscle pain	291/1534 (19.0)	166/635 (26.1)	125/899 (13.9)	<0.001
Abdominal pain	49/1534 (3.19)	16/635 (2.52)	33/899 (3.67)	0.280



1	Nausea/vomiting	178/1532 (11.6)	88/636 (13.8)	90/896 (10.0)	0.040
2	Diarrhea	269/1530 (17.6)	143/636 (22.5)	126/894 (14.1)	<0.001
3	Skin rash	8/1531 (0.5)	5/636 (0.8)	3/895 (0.3)	0.087
4	Anosmia	41/1153 (3.6)	29/489 (5.9)	12/664 (1.8)	<0.001
5	<b>Complications during admission</b>				
6	Bacterial pneumonia	43/1362 (3.2)	13/551 (2.4)	30/811 (3.7)	0.320
7	Sepsis	28/1372 (2.0)	16/554 (2.9)	12/818 (1.5)	0.054
8	Respiratory distress syndrome	195/1368 (14.2)	74/550 (13.4)	121/818 (14.8)	0.557
9	Pneumothorax	5/1373 (0.4)	3/556 (0.5)	2/817 (0.2)	0.488
10	Pleural effusion	29/1367 (2.1)	6/552 (1.1)	23/815 (2.8)	0.032
11	Stroke	11/1373 (0.8)	4/555 (0.7)	7/818 (0.9)	0.669
12	Disseminated intravascular coagulation	9/1369 (0.7)	2/554 (0.4)	7/815 (0.9)	0.360
13	Thrombosis	55/824 (6.7)	23/338 (6.8)	32/486 (6.6)	0.833
14	Acute renal failure	165/1373 (12.0)	37/556 (6.6)	128/817 (15.7)	<0.001
15	<b>Treatment</b>				
16	HCQ monotherapy	28/1549 (1.8)	7/642 (1.1)	21/907 (2.3)	0.075
17	HCQ + AZ	927/1549 (59.8)	448/642 (69.8)	479/907 (52.8)	<0.001
18	HCQ + LP/r	98/1549 (6.3)	32/642 (5.0)	66/907 (7.3)	<0.001
19	HCQ + AZ + LP/r	287/1549 (18.5)	90/642 (14.0)	197/907 (21.7)	<0.001
20	HCQ + LP/r + IFN-b	37/1549 (2.4)	12/642 (1.9)	25/907 (2.8)	0.260
21	HCQ + AZ + LP/r + IFN-b	113/1549 (7.3)	37/642 (5.8)	76/907 (8.4)	0.051
22	Tocilizumab	240/1549 (15.5)	144/642 (22.4)	96/907 (10.6)	<0.001
23	Corticosteroids	684/1549 (44.2)	264/642 (41.1)	420/907 (46.3)	<0.001

24 COPD: Chronic obstructive pulmonary disease; OSAS: obstructive sleep apnea syndrome; ICU: intensive care unit; HCQ:  
 25 hydroxichloroquine; AZ: azithromicine; LP/r: lopinavir-ritonavir; IFN-b: interferon-beta

Table 2. Clinical laboratory and diagnosis imaging characteristics of COVID-19 patients who have been admitted in ICU. Comparison between patients under 65 years admitted to ICU vs non-admitted to ICU.

	ICU patients cohort (n=81)	<65 y.o patients (n=575)		p-value
		Admitted to ICU (n=50)	Non-admitted to ICU (n=525)	
Age <sup>1</sup>	62 (51-71) (N=81)	54 (48-60) (N=50)	53 (45-59) (N=525)	0.625
Male <sup>2</sup>	60/81 (74.1)	21/50 (42.0)	325/525 (61.9)	0.048
Migrant <sup>2</sup>	25/81 (30.9)	21/50 (42.0)	238/525 (45.3)	0.651
Influenza vaccine 19-20 <sup>2</sup>	12/42 (28.6)	5/28 (17.9)	75/395 (19.0)	0.883
<b>Clinical background</b>				
Cardiovascular disease <sup>2</sup>	17/81 (21.0)	6/50 (12.0)	29/523 (5.5)	0.069
High blood pressure <sup>2</sup>	43/81 (53.1)	23/50 (46.0)	147/524 (28.1)	0.008
Diabetes mellitus <sup>2</sup>	23/81 (28.4)	10/50 (20.0)	65/519 (12.5)	0.315
Tobacco smoker/ex-smoker <sup>2</sup>	23/76 (30.3)	13/49 (26.5)	98/450 (21.8)	0.447
Obesity <sup>2</sup>	23/81 (28.4)	17/50 (34.0)	80/520 (15.4)	0.001
COPD <sup>2</sup>	7/81 (8.6)	4/50 (8.0)	30/521 (5.8)	0.522
Asthma <sup>2</sup>	5/81 (6.2)	4/50 (8.0)	43/522 (8.2)	0.117
OSAS <sup>2</sup>	8/39 (20.5)	8/27 (29.6)	22/332 (6.6)	<0.001
Thromboembolic disease <sup>2</sup>	2/40 (5.0)	2/28 (7.1)	8/338 (2.4)	0.136
Neurological disease <sup>2</sup>	5/80 (6.3)	2/49 (4.1)	31/521 (6.0)	0.786
Chronic kidney disease <sup>2</sup>	5/81 (6.2)	3/50 (6.0)	12/522 (2.3)	0.118
Liver cirrhosis <sup>2</sup>	1/80 (1.3)	1/50 (2.0)	11/522 (2.1)	0.117
Haematological/oncological cancer <sup>2</sup>	4/81 (4.9)	1/50 (2.0)	19/523 (3.6)	0.548
HIV <sup>2</sup>	0/81 (0.0)	0/50 (0.0)	7/522 (1.3)	0.529
<b>Clinical and laboratory presentation</b>				
Heart rate, beats per minute <sup>1</sup>	94 (83-107) (N=73)	54 (48-60) (N=50)	53 (45-59) (N=525)	0.625
Respiratory rate, breaths per minute <sup>1</sup>	23 (18-30) (N=44)	24 (18-30) (N=33)	18 (16-20) (N=222)	0.002
Systolic blood pressure, mmHg <sup>1</sup>	133 (119-142) (N=66)	128 (118-141) (N=42)	125 (114-137) (N=292)	0.591

1	SpO <sub>2</sub> , % <sup>1</sup>	88 (76-93) (N=69)	88 (66-94) (N=44)	96 (92-97) (N=454)	<0.001
2	SpO <sub>2</sub> <90% <sup>2</sup>	39/81 (48.1)	26/50 (52.0)	53/525 (10.1)	<0.001
3					
4	SpO <sub>2</sub> after oxygen administration, % <sup>1</sup>	95 (90-97) (N=39)	95 (90-98) (N=27)	96 (94-98) (N=91)	0.813
5	SpO <sub>2</sub> <90% after oxygen administration <sup>2</sup>	9/81 (11.1)	5/50 (10.0)	0/525 (0.0)	<0.001
6					
7	Hemoglobin, g/L <sup>1</sup>	13.9 (11.9-15.0) (N=81)	14.1 (12.1-15.2) (N=50)	14.1 (13.1-15.1) (N=493)	0.946
8					
9	Neutrophils, cells count/ $\mu$ L <sup>1</sup>	6300 (4500-9300) (N=81)	7000 (4600-8800) (N=50)	4700 (3500-6700) (N=495)	0.001
10					
11	Lymphocytes, cells count/ $\mu$ L <sup>1</sup>	900 (600-1200) (N=81)	900 (700-1300) (N=50)	1100 (800-1400) (N=495)	0.252
12					
13	Neutrophil/lymphocyte ratio <sup>1</sup>	6.64 (5.0-12.7) (N=81)	6.69 (4.8-12.3) (N=50)	4.4 (2.9-7.1) (N=495)	<0.001
14					
15	Platelets, $\times 10^9$ /L <sup>1</sup>	209 (170-267) (N=81)	205 (172-265) (N=50)	213 (171-274) (N=495)	0.777
16					
17	INR <sup>1</sup>	1.1 (1.0-1.2) (N=81)	1.1 (1.0-1.2) (N=50)	1.1 (1.0-1.1) (N=484)	0.035
18					
19	D-dimer, mg/L <sup>1</sup>	940 (485-2095) (N=56)	790 (470-2350) (N=35)	640 (400-1080) (N=334)	0.163
20					
21	LDH, U/L <sup>1</sup>	408 (279-542) (N=70)	415 (279-605) (N=43)	271 (215-348) (N=430)	<0.001
22					
23	ALT, U/L <sup>1</sup>	45 (32-67) (N=80)	50 (34-80) (N=50)	44 (30-66) (N=494)	0.075
24					
25	AST, U/L <sup>1</sup>	59 (40-82) (N=79)	60 (43-85) (N=50)	40 (29-57) (N=485)	<0.001
26					
27	Creatinine, mg/dL <sup>1</sup>	1.1 (0.9-1.3) (N=78)	1.1 (1.0-1.3) (N=48)	0.9 (0.7-1.1) (N=480)	<0.001
28					
29	C-reactive protein, mg/L <sup>1</sup>	1157 (481-2054) (N=80)	1234 (678-2133) (N=49)	522 (174-1152) (N=494)	<0.001
30					
31	<b>Diagnosis imaging</b>				
32					
33	Bilateral pulmonary infiltrates <sup>2</sup>	61/74 (82.4)	40/46 (87.0)	388/476 (81.5)	0.359
34					
35	Interstitial pulmonary infiltrates <sup>2</sup>	61/81 (75.3)	38/50 (76.0)	360/525 (68.6)	0.277
36					
37	Alveolar pulmonary infiltrates <sup>2</sup>	51/81 (63.0)	33/50 (66.0)	230/525 (43.8)	0.003
38					
39	<b>Respiratory supplementation</b>				
40					
41	Oxygen therapy <sup>2</sup>	77/81 (95.1)	47/50 (94.0)	345/516 (66.9)	<0.001
42					
43	Non-invasive ventilation <sup>2</sup>	38/80 (47.5)	26/49 (53.1)	25/513 (4.9)	<0.001
44					
45	Invasive ventilation <sup>2</sup>	67/81 (82.7)	43/50 (86.0)	0/514 (0.0)	<0.001
46					

COPD: chronic obstructive pulmonary disease; OSAS: Obstructive sleep apnea syndrome; HIV: Human immunodeficiency virus; SpO<sub>2</sub>: partial oxygen saturation; LDH: Lactate dehydrogenase; AST: aspartate transaminase; ALT: alanine aminotransferase

<sup>1</sup>continuous variable (median, IQR, N); <sup>2</sup>categorical variables (n/N, %)

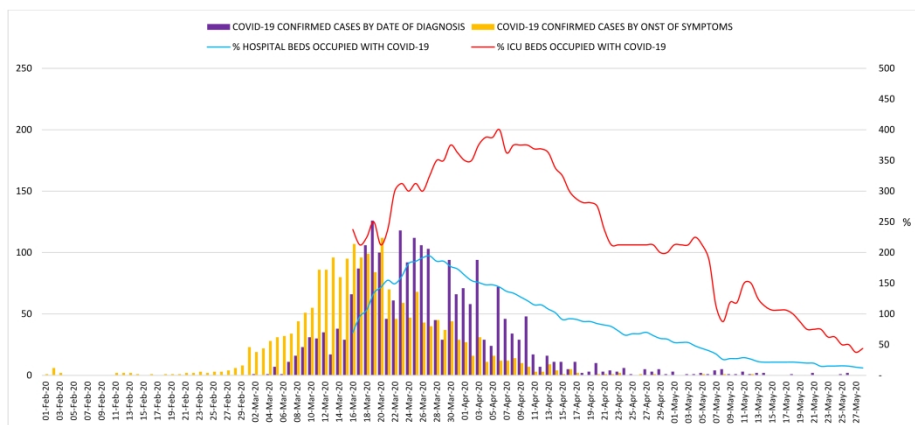
Table 3. Clinical, laboratory and diagnosis imaging characteristics of COVID-19 patients who died or recovered.

	<b>Death (n=296)</b>	<b>Recovered (n=1097)</b>	<b>p-value</b>
Age <sup>1</sup>	82 (71.5-87) (N=246)	65 (53-78) (N=1097)	<0.001
Male <sup>2</sup>	208/296 (70.3)	593/1097 (54.1)	<0.001
Migrant <sup>2</sup>	41/296 (13.8)	296/1097 (27.0)	<0.001
<b>Clinical background</b>			
Influenza vaccine 19/20 <sup>2</sup>	113/183 (61.7)	342/820 (41.7)	<0.001
Cardiovascular disease <sup>2</sup>	124/296 (41.9)	217/1093 (19.8)	<0.001
High blood pressure <sup>2</sup>	208/296 (70.3)	565/1096 (51.5)	<0.001
Diabetes mellitus <sup>2</sup>	90/295 (30.5)	260/1090 (23.8)	0.038
Tobacco smoker/exs-smoker <sup>2</sup>	111/260 (42.7)	236/950 (23.8)	<0.001
Obesity <sup>2</sup>	42/292 (14.4)	169/1085 (15.6)	0.169
COPD <sup>2</sup>	67/293 (22.9)	120/1092 (11.0)	<0.001
Asthma <sup>2</sup>	17/296 (5.7)	95/1093 (8.7)	0.166
OSAS <sup>2</sup>	20/156 (12.8)	53/687 (7.7)	0.041
Thromboembolic disease <sup>2</sup>	11/161 (6.8)	26/681 (3.8)	0.093
Neurological disease <sup>2</sup>	59/293 (20.1)	101/1091 (9.3)	<0.001
Chronic kidney disease <sup>2</sup>	40/295 (13.6)	58/1092 (5.3)	<0.001
Liver cirrhosis <sup>2</sup>	8/292 (2.7)	17/1093 (1.5)	0.352
Haematological/oncological cancer <sup>2</sup>	48/293 (16.4)	50/1092 (4.6)	<0.001
HIV <sup>2</sup>	0/295 (0.0)	8/1091 (0.7)	0.327
<b>Clinical and laboratory presentation</b>			
Heart rate, beats per minute <sup>1</sup>	88 (78-102) (N=242)	88 (78-100) (N=881)	0.856
Respiratory rate, breaths per minute <sup>1</sup>	21.5 (16-28) (N=116)	18 (16-20.5) (N=397)	<0.001
Systolic blood pressure, mmHg <sup>1</sup>	130 (111-147) (N=217)	130 (117-143) (N=683)	0.877
SpO <sub>2</sub> , % <sup>1</sup>	89 (82-93) (N=239)	95 (92-97) (N=945)	0.033

1	SpO <sub>2</sub> <90% <sup>2</sup>	121/203 (59.6)	152/945 (16.1)	<0.001
2	SpO <sub>2</sub> after oxygen administration, % <sup>1</sup>	94 (90.5-97) (N=112)	96 (94-98) (N=203)	0.003
3				
4	SpO <sub>2</sub> <90% after oxygen administration <sup>2</sup>	18/112 (16.1)	7/203 (0.1)	<0.001
5	Hemoglobin, g/L <sup>1</sup>	12.70 (11.00-14.50) (N=292)	13.70 (12.60-14.70) (N=1054)	<0.001
6				
7	Neutrophils, cells count/ $\mu$ L <sup>1</sup>	6100 (4200-8550) (N=292)	4800 (3500-6800) (N=1057)	<0.001
8				
9	Lymphocytes, cells count/ $\mu$ L <sup>1</sup>	800 (500-1100) (N=292)	1000 (800-1300) (N=1057)	<0.001
10				
11	Neutrophil/lymphocyte ratio <sup>1</sup>	7.17 (4.3-12.9) (N=292)	4.67 (3.1-7.4) (N=1057)	<0.001
12	Platelets, $\times 10^9/L^1$	190 (142.5-263.5) (N=292)	209 (162-273) (N=1057)	0.040
13				
14	INR <sup>1</sup>	1.1 (1.0-1.3) (N=283)	1.1 (1.0-1.2) (N=1026)	<0.001
15	D-dimer, mg/L <sup>1</sup>	1060 (570-2560) (N=167)	750 (450-1330) (N=685)	<0.001
16				
17	LDH, U/L <sup>1</sup>	345 (249-479) (N=235)	259 (210-331) (N=887)	<0.001
18				
19	ALT, U/L <sup>1</sup>	31 (23-47) (N=287)	36 (25-55) (N=1050)	<0.001
20				
21	AST, U/L <sup>1</sup>	47 (30-67) (N=284)	38 (28-55) (N=1035)	<0.001
22				
23	Creatinine, mg/dL <sup>1</sup>	1.2 (0.9-1.7) (N=285)	0.9(0.7-1.2) (N=1032)	<0.001
24	C-reactive protein, mg/L <sup>1</sup>	105.9 (36.2-182.4) (N=291)	53.8 (18.3-111.4)	<0.001
25	<b>Diagnosis imaging</b>			
26				
27	Bilateral pulmonary infiltrates <sup>2</sup>	218/259 (84.2)	762/960 (79.4)	0.084
28				
29	Interstitial pulmonary infiltrates <sup>2</sup>	182/296 (61.5)	689/1097 (62.8)	0.677
30				
31	Alveolar pulmonary infiltrates <sup>2</sup>	153/296 (51.7)	458/1097 (41.7)	0.002
32	<b>Respiratory supplementation</b>			
33				
34	Oxygen therapy <sup>2</sup>	285/292 (97.6)	458/1075 (76.5)	0.001
35				
36	Non-invasive ventilation <sup>2</sup>	57/289 (19.7)	64/1072 (6.0)	<0.001
37				
38	Invasive ventilation <sup>2</sup>	46/292 (15.7)	15/1075 (1.4)	<0.001

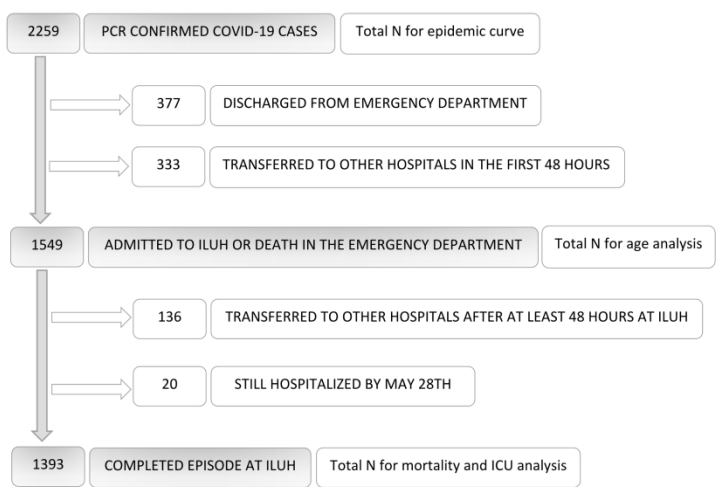
COPD: chronic obstructive pulmonary disease; OSAS: obstructive sleep apnea syndrome; HIV: Human immunodeficiency virus; SpO<sub>2</sub>: partial oxygen saturation; LDH: Lactate dehydrogenase; AST: aspartate transaminase; ALT: alanine aminotransferase

<sup>1</sup>continuous variable (median, IQR, N); <sup>2</sup>categorical variable (n/N, %)



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## Characteristics, Complications and Outcomes Among 2259 Patients Hospitalized with COVID-19 in a Secondary Level Hospital in Madrid, Spain

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	Yes <i>Pag 1-2</i>
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	Yes <i>Pag 1-2</i>
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Yes <i>Pag 3-4</i>
Objectives	3	State specific objectives, including any prespecified hypotheses	Yes <i>Pag 4</i>
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	Yes <i>Pag 5</i>
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Yes <i>Pag 5</i>
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	Yes <i>Pag 5</i>
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Yes <i>Pag 5-6</i>
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Yes <i>Pag 5-6</i>
Bias	9	Describe any efforts to address potential sources of bias	Yes <i>Pag 5-6</i>
Study size	10	Explain how the study size was arrived at	Yes <i>Pag 6</i>
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Yes <i>Pag 6</i>



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Statistical methods

- 12 (a) Describe all statistical methods, including those used to control for confounding
- (b) Describe any methods used to examine subgroups and interactions
- (c) Explain how missing data were addressed
- (d) *Cohort study*—If applicable, explain how loss to follow-up was addressed
- Case-control study*—If applicable, explain how matching of cases and controls was addressed
- Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
- (e) Describe any sensitivity analyses

**Yes**  
**Pag 6**  
**Yes**  
**Pag 6**

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60**Results**

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	<i>Yes</i> <i>Pag 7</i>
		(b) Give reasons for non-participation at each stage	<i>Yes</i> <i>Fig 2</i>
		(c) Consider use of a flow diagram	<i>Yes</i> <i>Fig 2</i>
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	<i>Yes</i> <i>Pag 7-10</i> <i>Fig 1</i> <i>Tables 1-3</i>
		(b) Indicate number of participants with missing data for each variable of interest	<i>Yes</i> <i>Tables 1-3</i>
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	<i>Yes</i> <i>Pag 9</i> <i>Fig 1</i>
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	<i>Yes</i> <i>Pag 9</i> <i>Table 3</i>
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	<i>Yes</i> <i>Pag 7-10</i> <i>Tables 1-3</i>
		(b) Report category boundaries when continuous variables were categorized	<i>Yes</i> <i>Pag 7-10</i> <i>Tables 1-3</i>
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	<i>Yes</i> <i>Pag 9</i> <i>Uni/multivariate</i>
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	<i>Yes</i> <i>Pag 10-12</i>
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	<i>Yes</i> <i>Pag 10-12</i>
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	<i>Yes</i> <i>Pag 10-12</i>
Generalisability	21	Discuss the generalisability (external validity) of the study results	<i>Yes</i> <i>Pag 12</i>

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60**Other information**

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	<i>Yes</i> <i>Pag 14</i>
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\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

# BMJ Open

## Characteristics, Complications and Outcomes Among 1,549 Patients Hospitalized with COVID-19 in a Secondary Hospital.

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Manuscript ID	bmjopen-2020-042398.R1
Article Type:	Original research
Date Submitted by the Author:	12-Sep-2020
Complete List of Authors:	<p>Jiménez, Eva; Hospital Universitario Infanta Leonor, Preventive Medicine Department  Fontán-Vela, Mario; Hospital Universitario Infanta Leonor, Preventive Medicine Department  Valencia, Jorge; Hospital Universitario Infanta Leonor, Internal Medicine Department  Fernandez-Jimenez, Ines; Hospital Universitario Infanta Leonor, Preventive Medicine Department  Álvaro-Alonso, Elena Alba; Hospital Universitario Infanta Leonor, Pharmacy Department  Izquierdo-García, Elsa; Hospital Universitario Infanta Leonor, Pharmacy Department  Lazaro Cebas, Andrea; Hospital Universitario Infanta Leonor, Pharmacy Department  Gallego Ruiz-Elvira, Elisa; Hospital Universitario Infanta Leonor, Preventive Medicine Department  Troya, Jesús; Hospital Universitario Infanta Leonor, Internal Medicine Department,  Tebar-Martinez, Ana Josefa; Hospital Universitario Infanta Leonor, Preventive Medicine Department  Garcia-Marina, Belén; Hospital Universitario Infanta Leonor, Emergency Department  Peña-Lillo, Gabriela; Hospital Universitario Infanta Leonor, Emergency Department  Abad-Motos, Ane; Hospital Universitario Infanta Leonor, Anesthesiology Department  Macaya, Laura; Hospital Universitario Infanta Leonor, Intensive Care Department  Ryan, Pablo; Hospital Universitario Infanta Leonor, Internal Medicine Department  Pérez-Butragueño, Mario; Hospital Universitario Infanta Leonor, Pediatrics Department</p>
<b>Primary Subject Heading</b>:	Epidemiology
Secondary Subject Heading:	Infectious diseases, Public health
Keywords:	INFECTIOUS DISEASES, PUBLIC HEALTH, Epidemiology < INFECTIOUS DISEASES, COVID-19

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# Characteristics, Complications and Outcomes Among 1,549 Patients Hospitalized with COVID-19 in a Secondary Hospital

## AUTHORS

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**\*\*Both authors contributed equally to this study**

**\*\*\*A complete list of the members of the COVID@HUIL Working Group is provided at the end of the document.**

**KEYWORDS:** COVID-19, secondary-level hospital, epidemiology.

## ABSTRACT

**Objectives:** to describe demographic, clinical, radiological and laboratory characteristics, as well as outcomes, of patients admitted for COVID-19 in a secondary hospital. **Design and setting:** Retrospective case series of sequentially hospitalized patients with confirmed SARS-CoV-2, at Infanta Leonor University Hospital (ILUH) in Madrid, Spain. **Participants:** All patients attended at ILUH testing positive to RT-PCR on nasopharyngeal swabs and diagnosed with COVID-19 between 1 March 2020 and 28 May 2020. **Results:** A total of 1,549 COVID-19 cases were included (median age 69 [IQR 55.0- 81.0], 57.5% male). 78.2% had at least one underlying comorbidity, the most frequent was hypertension (55.8%). Most frequent symptoms at presentation were fever (75.3%), cough (65.7%) and dyspnea (58.1%). 81 (5.8%) patients were admitted to the intensive care unit (ICU) (median age 62 [IQR 51-71]; 74.1% male; median length of stay 9 days [IQR 5-19]) 82.7% of them needed invasive ventilation support. 1393 patients had an outcome at the end of the study period (case fatality ratio: 21.2% (296/1,393)). The independent factors associated with fatality (OR; 95% CI): age (1.07; 1.06-1.09), male sex (2.86; 1.85-4.50), neurological disease (1.93; 1.19-3.13), chronic kidney disease (2.83; 1.40-5.71) and neoplasia (4.29; 2.40-7.67). The percentage of hospital beds occupied with COVID-19 almost doubled (702/361), with the number of patients in ICU quadrupling its capacity (32/8). Median length of stay was 9 days (IQR 6-14). **Conclusions:** This study provides clinical characteristics, complications and outcomes of COVID-19 patients admitted to a European secondary hospital. Fatal outcomes were similar to those reported by hospitals with a higher level of complexity.



**STRENGTHS AND LIMITATIONS OF THIS STUDY**-This is a large retrospective case series study of 1549 sequentially hospitalized patients with confirmed SARS-CoV-2.

-The study describes the response of a secondary hospital based in a region of Spain with the highest incidence of COVID-19, and how the hospital was transformed into a center entirely dedicated to COVID-19.

-A complete follow-up was made of all patients during hospital stay, although after discharge no outcome information was collected, so only in-hospital fatality could be estimated.

## BACKGROUND

In December 2019, a novel coronavirus (severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2]) emerged in China and spread globally, causing a new infectious disease named “coronavirus disease 2019” (COVID-19) (1). By 28 May 2020, the epidemic reaches 5,593,631 confirmed cases and more than 353,334 deaths across 216 countries all over the world (2).

The first confirmed case of COVID-19 in Spain was reported from La Gomera (Canary Islands) on 31 January 2020 (3). But it was not until the last week of February 2020 when the first five cases were reported in the Community of Madrid (4).

During March and April 2020 (first COVID-19 wave in Spain and Europe), Spain had been one of the most affected countries by the coronavirus, being one of the main outbreaks of the disease worldwide. Spain, is now the second country in Europe with

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3 the highest number of confirmed cases (after the Russian Federation) with 470.973  
4 cases as of 1 September 2020 (2,5,6). The rate of infections in the Community of  
5 Madrid has exceeded every other region in Spain, with more than 27% of all confirmed  
6 cases in Spain and an accumulated number of 45,074 hospitalized patients and 8,662  
7 deaths as of 1 September 2020 (5).

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15 Hospitals of the various regional health services of Spain are categorized into different  
16 complexity levels depending on their size, technological resources and the higher or  
17 lower availability of different clinical departments, thus, in ascending order of  
18 complexity we have primary, secondary and tertiary level hospitals; tertiary hospitals  
19 often have specific clinical departments that attend patients coming from different parts  
20 of the country. The Infanta Leonor University Hospital (ILUH) is a secondary level  
21 hospital with 361 beds, including 8 in the intensive care unit (ICU). It serves the  
22 population of Vallecas (305,262 individuals) (7). Our healthcare area has a  
23 disproportionate number of beds per inhabitants: 1.07 beds per 1000 people  
24 compared to 2.15 beds per 1000 people overall within the region. Vallecas is one of  
25 the COVID-19 most affected areas in the city of Madrid (Spain) with 9,947 total  
26 confirmed COVID-19 cases as of 1 September 2020 (8). Therefore, the level of  
27 hospital saturation during the epidemic has been one of the greatest in Spain. As a  
28 consequence, the hospital was in March transformed into a center entirely dedicated  
29 to COVID-19 and all its professionals focused on assisting patients affected by the  
30 SARS-CoV-2 infection.

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53 Limited information is available to describe characteristics, complications and mortality  
54 in COVID-19 overloaded secondary Spanish hospitals. The available data from Spain  
55 refer to tertiary hospitals, multi-centric studies or primary care settings (9–12).

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3 This study describes the clinical characteristics, severity, types of treatments and  
4 overall outcomes of patients with confirmed SARS-CoV-2 infection admitted to ILUH  
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6 in Madrid (Spain).  
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## 10 11 12 13 **METHODS**

### 14 15 16 **Study design and participants:**

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19 A single-center retrospective observational study that included patients attended at  
20 ILUH with a laboratory-confirmed COVID-19 between 1 March 2020 and 28 May 2020.  
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22 SARS-CoV-2 infection was confirmed by real-time reverse transcriptase–polymerase  
23 chain reaction (RT-PCR) assay (FTD SARS-CoV-2 Assay by SIEMENS) from  
24 nasopharyngeal swabs (Deltaswab by Deltalab). Patients discharged from the  
25 emergency department and those transferred to another hospital in the first 48 hours  
26 were not included in the final analysis; although these patients were hospitalized at  
27 ILUH, they didn't stay enough time to record all the relevant clinical data due to the  
28 hospital overcapacity context. Once selected patients that met inclusion criteria, no-  
29 one was excluded.  
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43 Epidemiological and demographic data, medical history, baseline comorbidities,  
44 symptoms and signs both at admission and during follow-up, laboratory findings, RT-  
45 PCR results, treatment strategy used for COVID-19, complications and survival data  
46 were obtained from patient's electronic medical records. All-cause mortality was  
47 calculated including deaths occurred both in patients pending admission (first 48  
48 hours) and during hospitalization. ICU admission, hospitalization length of stay and  
49 ventilatory support (invasive mechanical ventilation, noninvasive mechanical  
50 ventilation or oxygen mask) were also registered. Different time intervals were  
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3 calculated: lag time between symptoms onset and diagnosis, length of stay at ICU  
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5 and overall length of stay at the hospital.  
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8 Data were collected and managed using REDCap electronic data capture tools hosted  
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10 at Ideas for Health Association. REDCap (Research Electronic Data Capture) is a  
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12 secure, web-based software platform designed to support data capture for research  
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14 studies (13).  
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18 The STROBE statement guidelines were followed in the conduct and reporting of the  
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20 study (see Supplementary files).  
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### 23 **Patient and Public Involvement:**

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26 There was no patient or public involvement in the development of the research  
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28 design or in conducting the study.  
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### 31 **Statistical Analysis:**

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34 A descriptive analysis of the clinical background and baseline characteristics of the  
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36 patients was performed. Continuous variables are presented as median and  
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38 interquartile range (IQR), after testing normal distribution. Categorical variables are  
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40 expressed as number of patients and percentage. Two age-groups were defined using  
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42 a cut off value of 65 (<65 and ≥65 years old) for the comparison of the clinical  
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44 characteristics of the cohort. For the ICU analysis, the comparison of the  
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46 characteristics between admitted and non-admitted to ICU patients were limited to  
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48 patients under 65 because age was one of the major criteria for a better allocation of  
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50 ICU resources in a context of limited availability of them.  
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56 For the mortality analysis, the case fatality ratio (CFR) was defined as number of  
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58 deaths of laboratory-confirmed COVID-19 patients divided by the number of  
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laboratory-confirmed COVID-19 cases admitted to the hospital. The outcomes were defined as death or recovered, and the clinical characteristics between these groups were compared using Chi-square test for the categorical variables and Median test for the quantitative variables.

Logistic regression analysis was carried out to ascertain the effect of sociodemographic and clinical background characteristics on mortality. Variables that showed statistical significance ( $p < 0.05$ ) in the univariate analysis and clinical variables that could have potential relevance on the outcome according to the current available evidence were included in the model. Odds Ratio (OR) and 95% confidence intervals (95% CI) were calculated.

Statistical analyses were done using Stata software (version 14.0; Stata Corporation, College Station, Texas, USA).

### **Ethical aspects:**

The Institutional Investigation and Ethics Review Board of Infanta Leonor University Hospital (CEI-ILUH) approved the study (Code ILUH R 027-20) and due to its retrospective nature, the need for informed consent from patients was waived.

## **RESULTS**

Overall, 2,259 COVID-19 confirmed cases were attended at ILUH during the study period. The daily number of confirmed COVID-19 cases are plotted by the date of diagnosis (date of positive RT-PCR) and by the date of symptoms onset in **Figure 1**. The first positive patient in our hospital was diagnosed on 1 March 2020 and the epidemic curve peaked on 19 March when 126 PCR tested positive. From that date,

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3 the incidence declined gradually but it took over a month to have a daily number of  
4 new cases below 10. The percentage of ICU beds and total hospital beds occupied  
5 with COVID-19 patients are shown in **Figure 1**. On 27 March, our hospital almost  
6 doubled its bed capacity with 702 hospitalized patients. On 6 April, 32 patients were  
7 in ICU, reaching 400% of hospital ICU capacity.  
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15 Among these 2,259 patients, we analyzed 1,549 cases and excluded 710 because  
16 they were discharged from the emergency department or transferred to other hospitals  
17 in the first 48 hours. For the complications, ICU and mortality analysis, 156 patients  
18 with an uncomplete episode were excluded because they were transferred to other  
19 hospitals during their stay or were still hospitalized by 28 May 2020 (**Figure 2**).  
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27 Age range of the 1,549 hospitalized patients varied from 3 weeks to 102 years old,  
28 median was 69 (IQR 55.0-81.0), and 57.5% were male. All patients except for the  
29 three-week-old baby were adults. 55.0% had hypertension, 24.8% diabetes, 24.3%  
30 cardiovascular disease, 15.7% obesity, 13.7% chronic obstructive pulmonary disease  
31 (COPD) and 8.5% obstructive sleep apnea syndrome (OSAS). HIV infection (0.6%)  
32 and autoimmune disease (5.2%) were rare. Overall, 1,221 (78.2%) patients had at  
33 least one underlying comorbidity.  
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44 The median lag time between symptoms onset and diagnosis was 7 days (IQR: 4-9)  
45 (**Figure 1**). The commonest symptoms at presentation were fever (75.3%), cough  
46 (65.7%) and dyspnea (58.1%). Diarrhea (17.6%) and anosmia (3.6%) were less  
47 common in our case series. Fever, headache, cough, diarrhea, nausea/vomiting,  
48 anosmia, muscle or chest pain were more frequent in younger patients while cognitive  
49 deterioration was in older patients (**Table 1**).  
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Table 1. Clinical characteristics and treatment (N= 1549)				
	Overall	< 65 y.o.	≥ 65 y.o.	
	n/N (%)	n/N (%)	n/N (%)	p-value
Male	890/1549 (57.5)	400/642 (62.3)	490/907 (54.0)	0.001
Migrant	385/1549 (24.8)	296/642 (46.1)	89/642 (13.9)	<0.001
<b>Clinical background</b>				
Influenza vaccine 19/20	498/1101 (45.2)	90/463 (19.4)	408/638 (63.9)	<0.001
Cardiological disease	375/1545 (24.3)	37/640 (5.8)	338/905 (37.3)	<0.001
High blood pressure	851/1548 (55.0)	185/641 (28.9)	666/907 (73.4)	<0.001
Diabetes mellitus	382/1541 (24.8)	85/636 (13.4)	297/905 (32.8)	<0.001
Tobacco smoker/ex-smoker	374/1344 (27.8)	121/555 (21.8)	253/789 (32.0)	<0.001
Obesity	240/1531 (15.7)	110/636 (17.3)	130/895 (14.5)	0.129
COPD	211/1541 (13.7)	37/638 (5.8)	174/903 (19.3)	<0.001
Asthma	122/1545 (7.9)	51/639 (8.0)	71/906 (7.8)	0.668
OSAS	79/935 (8.4)	32/401 (8.0)	47/534 (8.8)	0.654
Cerebrovascular disease	57/125 (45.6)	12/28 (42.7)	45/97 (46.4)	0.741
Thromboembolic disease	41/939 (4.4)	10/410 (2.4)	31/529 (5.9)	0.011
Neurological disease	178/1540 (11.6)	37/637 (5.8)	141/903 (15.6)	<0.001
Chronic kidney disease	104/1543 (6.7)	16/639 (2.5)	88/904 (9.7)	<0.001
Cirrhosis	28/1540 (1.8)	13/638 (2.0)	15/902 (1.7)	0.209
Haematological/oncological cancer	103/1540 (6.7)	21/640 (3.3)	82/900 (9.1)	<0.001
HIV	9/1542 (0.6)	7/639 (1.1)	2/903 (0.2)	0.012
Autoimmune disease	47/913 (5.1)	17/393 (4.3)	30/520 (5.8)	0.328
<b>Symptoms</b>				
Fever	1159/1540 (75.3)	533/638 (83.5)	626/902 (69.4)	<0.001
Headache	133/1533 (8.7)	92/634 (14.5)	41/899 (4.6)	<0.001
Malaise	671/1533 (43.8)	282/637 (44.3)	389/896 (43.3)	0.928
Confused	87/1532 (5.7)	11/633 (1.7)	76/899 (8.4)	<0.001
Dyspnea	891/1533 (58.1)	362/632 (57.3)	529/901 (58.7)	0.382
Superior respiratory tract symptoms	316/1534 (20.6)	153/635 (24.1)	163/899 (18.1)	0.009
Cough	1010/1538 (65.7)	469/638 (73.5)	541/900 (60.1)	<0.001
Expectoration	194/1535 (12.6)	69/635 (10.9)	125/900 (13.9)	0.167
Hemoptysis	26/1532 (1.7)	15/633 (2.3)	11/899 (1.2)	0.207
Chest pain	134/1534 (8.7)	79/635 (12.4)	55/899 (6.1)	<0.001
Muscle pain	291/1534 (19.0)	166/635 (26.1)	125/899 (13.9)	<0.001
Abdominal pain	49/1534 (3.19)	16/635 (2.52)	33/899 (3.67)	0.280
Nausea/vomiting	178/1532 (11.6)	88/636 (13.8)	90/896 (10.0)	0.040
Diarrhea	269/1530 (17.6)	143/636 (22.5)	126/894 (14.1)	<0.001
Skin rash	8/1531 (0.5)	5/636 (0.8)	3/895 (0.3)	0.087
Anosmia	41/1153 (3.6)	29/489 (5.9)	12/664 (1.8)	<0.001
<b>Complications during admission</b>				
Bacterial pneumonia	43/1362 (3.2)	13/551 (2.4)	30/811 (3.7)	0.320
Sepsis	28/1372 (2.0)	16/554 (2.9)	12/818 (1.5)	0.054
Respiratory distress syndrome	195/1368 (14.2)	74/550 (13.4)	121/818 (14.8)	0.557
Pneumothorax	5/1373 (0.4)	3/556 (0.5)	2/817 (0.2)	0.488
Pleural effusion	29/1367 (2.1)	6/552 (1.1)	23/815 (2.8)	0.032



Stroke	11/1373 (0.8)	4/555 (0.7)	7/818 (0.9)	0.669
Disseminated intravascular coagulation	9/1369 (0.7)	2/554 (0.4)	7/815 (0.9)	0.360
Thrombosis	55/824 (6.7)	23/338 (6.8)	32/486 (6.6)	0.833
Acute renal failure	165/1373 (12.0)	37/556 (6.6)	128/817 (15.7)	<0.001
<b>Treatment</b>				
HCQ monotherapy	28/1549 (1.8)	7/642 (1.1)	21/907 (2.3)	0.075
HCQ + AZ	927/1549 (59.8)	448/642 (69.8)	479/907 (52.8)	<0.001
HCQ + LP/r	98/1549 (6.3)	32/642 (5.0)	66/907 (7.3)	<0.001
HCQ + AZ + LP/r	287/1549 (18.5)	90/642 (14.0)	197/907 (21.7)	<0.001
HCQ + LP/r + IFN-b	37/1549 (2.4)	12/642 (1.9)	25/907 (2.8)	0.260
HCQ + AZ + LP/r + IFN-b	113/1549 (7.3)	37/642 (5.8)	76/907 (8.4)	0.051
Tocilizumab	240/1549 (15.5)	144/642 (22.4)	96/907 (10.6)	<0.001
Corticosteroids	684/1549 (44.2)	264/642 (41.1)	420/907 (46.3)	<0.001
COPD: Chronic obstructive pulmonary disease; OSAS: obstructive sleep apnea syndrome; ICU: intensive care unit; HCQ: hydroxychloroquine; AZ: azithromycin; LP/r: lopinavir-ritonavir; IFN-b: interferon-beta				

The most frequent therapies used for treating COVID-19 were the combination hydroxychloroquine plus azithromycin (59.9%) and the combination hydroxychloroquine plus azithromycin plus lopinavir-ritonavir (18.5%). Any treatment combination including lopinavir-ritonavir was more frequently used in older patients. Tocilizumab was used in 15.5% of the patients and corticosteroids in 44.2%. (**Table 1**).

The analysis of the complications during admission showed that 14.3% of patients had acute respiratory distress syndrome with no differences between age groups, 12.0% had acute kidney failure which was more frequent in older patients (15.7% vs. 6.7%), 6.7% had a clinical thrombotic event and 0.7% had disseminated intravascular coagulation (**Table 1**).

Among patients with a complete episode at ILUH, 81 were admitted to ICU: median age 62 (IQR 51-71); 74.1% male.; median length of stay 9 days [IQR 5-19] and 82.7% of them needed invasive ventilation support Clinical characteristics are shown in **Table**



2. Among the 575 patients younger than 65 years old with a complete episode at ILUH, risk factors associated to ICU admission in the univariate analysis were: being male, obesity, hypertension, OSAS, high respiratory rate, a low blood oxygen saturation level (SpO<sub>2</sub>) at admission, a high neutrophil/lymphocyte ratio, an elevated plasma INR, lactate dehydrogenase (LDH), aspartate transaminase (AST), creatinine and C-reactive protein and the presence of alveolar pulmonary infiltrates in the chest x-ray. (**Table 2**). We calculated CFR in ICU patients with a complete episode at ILUH (70 patients): global CFR was 72.9% (62.8% in the under 65 group and 88.9% in the older group).

Table 2. Clinical, laboratory and diagnosis imaging characteristics of COVID-19 patients who have been admitted in ICU. Comparison between patients under 65 years of age admitted to ICU vs non-admitted to ICU.				
	ICU patients cohort (n=81)	<65 y. old patients (n=575)		
		Admitted to ICU (n=50)	Non-admitted to ICU (n=525)	p-value
Age <sup>1</sup>	62 (51-71) (N=81)	54 (48-60) (N=50)	53 (45-59) (N=525)	0.625
Male <sup>2</sup>	60/81 (74.1)	21/50 (42.0)	325/525 (61.9)	0.048
Migrant <sup>2</sup>	25/81 (30.9)	21/50 (42.0)	238/525 (45.3)	0.651
Influenza vaccine 19-20 <sup>2</sup>	12/42 (28.6)	5/28 (17.9)	75/395 (19.0)	0.883
<b>Clinical background</b>				
Cardiovascular disease <sup>2</sup>	17/81 (21.0)	6/50 (12.0)	29/523 (5.5)	0.069
High blood pressure <sup>2</sup>	43/81 (53.1)	23/50 (46.0)	147/524 (28.1)	0.008
Diabetes mellitus <sup>2</sup>	23/81 (28.4)	10/50 (20.0)	65/519 (12.5)	0.315
Tobacco smoker/ex-smoker <sup>2</sup>	23/76 (30.3)	13/49 (26.5)	98/450 (21.8)	0.447
Obesity <sup>2</sup>	23/81 (28.4)	17/50 (34.0)	80/520 (15.4)	0.001
COPD <sup>2</sup>	7/81 (8.6)	4/50 (8.0)	30/521 (5.8)	0.522
Asthma <sup>2</sup>	5/81 (6.2)	4/50 (8.0)	43/522 (8.2)	0.117

OSAS <sup>2</sup>	8/39 (20.5)	8/27 (29.6)	22/332 (6.6)	<0.001
Thromboembolic disease <sup>2</sup>	2/40 (5.0)	2/28 (7.1)	8/338 (2.4)	0.136
Neurological disease <sup>2</sup>	5/80 (6.3)	2/49 (4.1)	31/521 (6.0)	0.786
Chronic kidney disease <sup>2</sup>	5/81 (6.2)	3/50 (6.0)	12/522 (2.3)	0.118
Liver cirrhosis <sup>2</sup>	1/80 (1.3)	1/50 (2.0)	11/522 (2.1)	0.117
Haematological/oncological cancer <sup>2</sup>	4/81 (4.9)	1/50 (2.0)	19/523 (3.6)	0.548
HIV <sup>2</sup>	0/81 (0.0)	0/50 (0.0)	7/522 (1.3)	0.529
<b>Clinical and laboratory presentation</b>				
Heart rate, beats per minute <sup>1</sup>	94 (83-107) (N=73)	54 (48-60) (N=50)	53 (45-59) (N=525)	0.625
Respiratory rate, breaths per minute <sup>1</sup>	23 (18-30) (N=44)	24 (18-30) (N=33)	18 (16-20) (N=222)	0.002
Systolic blood pressure, mmHg <sup>1</sup>	133 (119-142) (N=66)	128 (118-141) (N=42)	125 (114-137) (N=292)	0.591
SpO <sub>2</sub> , % <sup>1</sup>	88 (76-93) (N=69)	88 (66-94) (N=44)	96 (92-97) (N=454)	<0.001
SpO <sub>2</sub> <90% <sup>2</sup>	39/81 (48.1)	26/50 (52.0)	53/525 (10.1)	<0.001
SpO <sub>2</sub> after oxygen administration, % <sup>1</sup>	95 (90-97) (N=39)	95 (90-98) (N=27)	96 (94-98) (N=91)	0.813
SpO <sub>2</sub> <90% after oxygen administration <sup>2</sup>	9/81 (11.1)	5/50 (10.0)	0/525 (0.0)	<0.001
Hemoglobin, g/L <sup>1</sup>	13.9 (11.9-15.0) (N=81)	14.1 (12.1-15.2) (N=50)	14.1 (13.1-15.1) (N=493)	0.946
Neutrophils, cells count/ $\mu$ L <sup>1</sup>	6300 (4500-9300) (N=81)	7000 (4600-8800) (N=50)	4700 (3500-6700) (N=495)	0.001
Lymphocytes, cells count/ $\mu$ L <sup>1</sup>	900 (600-1200) (N=81)	900 (700-1300) (N=50)	1100 (800-1400) (N=495)	0.252
Neutrophil/lymphocyte ratio <sup>1</sup>	6.64 (5.0-12.7) (N=81)	6.69 (4.8-12.3) (N=50)	4.4 (2.9-7.1) (N=495)	<0.001
Platelets, $\times 10^9$ /L <sup>1</sup>	209 (170-267) (N=81)	205 (172-265) (N=50)	213 (171-274) (N=495)	0.777
INR <sup>1</sup>	1.1 (1.0-1.2) (N=81)	1.1 (1.0-1.2) (N=50)	1.1 (1.0-1.1) (N=484)	0.035
D-dimer, mg/L <sup>1</sup>	940 (485-2095) (N=56)	790 (470-2350) (N=35)	640 (400-1080) (N=334)	0.163
LDH, U/L <sup>1</sup>	408 (279-542) (N=70)	415 (279-605) (N=43)	271 (215-348) (N=430)	<0.001
ALT, U/L <sup>1</sup>	45 (32-67) (N=80)	50 (34-80) (N=50)	44 (30-66) (N=494)	0.075
AST, U/L <sup>1</sup>	59 (40-82) (N=79)	60 (43-85) (N=50)	40 (29-57) (N=485)	<0.001

Creatinine, mg/dL <sup>1</sup>	1.1 (0.9-1.3) (N=78)	1.1 (1.0-1.3) (N=48)	0.9 (0.7-1.1) (N=480)	<0.001
C-reactive protein, mg/L <sup>1</sup>	1157 (481-2054) (N=80)	1234 (678-2133) (N=49)	522 (174-1152) (N=494)	<0.001
<b>Diagnosis imaging</b>				
Bilateral pulmonary infiltrates <sup>2</sup>	61/74 (82.4)	40/46 (87.0)	388/476 (81.5)	0.359
Interstitial pulmonary infiltrates <sup>2</sup>	61/81 (75.3)	38/50 (76.0)	360/525 (68.6)	0.277
Alveolar pulmonary infiltrates <sup>2</sup>	51/81 (63.0)	33/50 (66.0)	230/525 (43.8)	0.003
<b>Respiratory supplementation</b>				
Oxygen therapy <sup>2</sup>	77/81 (95.1)	47/50 (94.0)	345/516 (66.9)	<0.001
Non-invasive ventilation <sup>2</sup>	38/80 (47.5)	26/49 (53.1)	25/513 (4.9)	<0.001
Invasive ventilation <sup>2</sup>	67/81 (82.7)	43/50 (86.0)	0/514 (0.0)	<0.001
COPD: chronic obstructive pulmonary disease; OSAS: Obstructive sleep apnea syndrome; HIV: Human immunodeficiency virus; SpO <sub>2</sub> : partial oxygen saturation; LDH: Lactate dehydrogenase; AST: aspartate transaminase; ALT: alanine aminotransferase				
<sup>1</sup> continuous variable (median, IQR, N); <sup>2</sup> categorical variables (n/N, %)				

The overall CFR in our cohort was 21.2% (296/1,393 cases). The median length of stay was 9 days (IQR 6-14). Among the 296 deaths, 48 occurred in the first 48 hours and the rest during hospitalization. These 48 patients had a higher median age compared to the global cohort (82.5 vs 69) and their median lag time from symptom onset until fatality was lower (7 days vs 13.5 days,  $p < 0.001$ ). As shown in **Table 3**, patients who died were older and more likely to be male, current smoker/ex-smoker, and had hypertension, cardiovascular disease, COPD, OSAS, diabetes mellitus, neurological disease, chronic kidney disease and neoplasia in the univariate analysis. Also, they received more frequently ventilatory support during hospitalization and showed more alveolar pulmonary infiltrates in chest x-ray than people who recovered.

Table 3. Clinical, laboratory and diagnosis imaging characteristics of COVID-19 patients who died or recovered.			
	<b>Death (n=296)</b>	<b>Recovered (n=1097)</b>	<b>p-value</b>
Age <sup>1</sup>	82 (71.5-87) (N=246)	65 (53-78) (N=1097)	<0.001
Male <sup>2</sup>	208/296 (70.3)	593/1097 (54.1)	<0.001

Migrant <sup>2</sup>	41/296 (13.8)	296/1097 (27.0)	<0.001
<b>Clinical background</b>			
Influenza vaccine 19/20 <sup>2</sup>	113/183 (61.7)	342/820 (41.7)	<0.001
Cardiovascular disease <sup>2</sup>	124/296 (41.9)	217/1093 (19.8)	<0.001
High blood pressure <sup>2</sup>	208/296 (70.3)	565/1096 (51.5)	<0.001
Diabetes mellitus <sup>2</sup>	90/295 (30.5)	260/1090 (23.8)	0.038
Tobacco smoker/exs-smoker <sup>2</sup>	111/260 (42.7)	236/950 (23.8)	<0.001
Obesity <sup>2</sup>	42/292 (14.4)	169/1085 (15.6)	0.169
COPD <sup>2</sup>	67/293 (22.9)	120/1092 (11.0)	<0.001
Asthma <sup>2</sup>	17/296 (5.7)	95/1093 (8.7)	0.166
OSAS <sup>2</sup>	20/156 (12.8)	53/687 (7.7)	0.041
Thromboembolic disease <sup>2</sup>	11/161 (6.8)	26/681 (3.8)	0.093
Neurological disease <sup>2</sup>	59/293 (20.1)	101/1091 (9.3)	<0.001
Chronic kidney disease <sup>2</sup>	40/295 (13.6)	58/1092 (5.3)	<0.001
Liver cirrhosis <sup>2</sup>	8/292 (2.7)	17/1093 (1.5)	0.352
Haematological/oncological cancer <sup>2</sup>	48/293 (16.4)	50/1092 (4.6)	<0.001
HIV <sup>2</sup>	0/295 (0.0)	8/1091 (0.7)	0.327
<b>Clinical and laboratory presentation</b>			
Heart rate, beats per minute <sup>1</sup>	88 (78-102) (N=242)	88 (78-100) (N=881)	0.856
Respiratory rate, breaths per minute <sup>1</sup>	21.5 (16-28) (N=116)	18 (16-20.5) (N=397)	<0.001
Systolic blood pressure, mmHg <sup>1</sup>	130 (111-147) (N=217)	130 (117-143) (N=683)	0.877
SpO <sub>2</sub> , % <sup>1</sup>	89 (82-93) (N=239)	95 (92-97) (N=945)	0.033
SpO <sub>2</sub> <90% <sup>2</sup>	121/203 (59.6)	152/945 (16.1)	<0.001
SpO <sub>2</sub> after oxygen administration, % <sup>1</sup>	94 (90.5-97) (N=112)	96 (94-98) (N=203)	0.003
SpO <sub>2</sub> <90% after oxygen administration <sup>2</sup>	18/112 (16.1)	7/203 (0.1)	<0.001
Hemoglobin, g/L <sup>1</sup>	12.70 (11.00-14.50) (N=292)	13.70 (12.60-14.70) (N=1054)	<0.001
Neutrophils, cells count/ $\mu$ L <sup>1</sup>	6100 (4200-8550) (N=292)	4800 (3500-6800) (N=1057)	<0.001
Lymphocytes, cells count/ $\mu$ L <sup>1</sup>	800 (500-1100) (N=292)	1000 (800-1300) (N=1057)	<0.001
Neutrophil/lymphocyte ratio <sup>1</sup>	7.17 (4.3-12.9) (N=292)	4.67 (3.1-7.4) (N=1057)	<0.001
Platelets, $\times 10^9/L^1$	190 (142.5-263.5) (N=292)	209 (162-273) (N=1057)	0.040
INR <sup>1</sup>	1.1 (1.0-1.3) (N=283)	1.1 (1.0-1.2) (N=1026)	<0.001
D-dimer, mg/L <sup>1</sup>	1060 (570-2560) (N=167)	750 (450-1330) (N=685)	<0.001
LDH, U/L <sup>1</sup>	345 (249-479) (N=235)	259 (210-331) (N=887)	<0.001
ALT, U/L <sup>1</sup>	31 (23-47) (N=287)	36 (25-55) (N=1050)	<0.001

AST, U/L <sup>1</sup>	47 (30-67) (N=284)	38 (28-55) (N=1035)	<0.001
Creatinine, mg/dL <sup>1</sup>	1.2 (0.9-1.7) (N=285)	0.9(0.7-1.2) (N=1032)	<0.001
C-reactive protein, mg/L <sup>1</sup>	105.9 (36.2-182.4) (N=291)	53.8 (18.3-111.4)	<0.001
<b>Diagnosis imaging</b>			
Bilateral pulmonary infiltrates <sup>2</sup>	218/259 (84.2)	762/960 (79.4)	0.084
Interstitial pulmonary infiltrates <sup>2</sup>	182/296 (61.5)	689/1097 (62.8)	0.677
Alveolar pulmonary infiltrates <sup>2</sup>	153/296 (51.7)	458/1097 (41.7)	0.002
<b>Respiratory supplementation</b>			
Oxygen therapy <sup>2</sup>	285/292 (97.6)	458/1075 (76.5)	0.001
Non-invasive ventilation <sup>2</sup>	57/289 (19.7)	64/1072 (6.0)	<0.001
Invasive ventilation <sup>2</sup>	46/292 (15.7)	15/1075 (1.4)	<0.001
COPD: chronic obstructive pulmonary disease; OSAS: obstructive sleep apnea syndrome; HIV: Human immunodeficiency virus; SpO <sub>2</sub> : partial oxygen saturation; LDH: Lactate dehydrogenase; AST: aspartate transaminase; ALT: alanine aminotransferase <sup>1</sup> continuous variable (median, IQR, N); <sup>2</sup> categorical variable (n/N, %)			

In the multivariate analysis, independent factors related to death were: years of age (OR 1.07; 95% CI: 1.06-1.09), being male (OR 2.86; 95% CI: 1.85-4.50), neurological disease (OR 1.93; 95% CI: 1.19-3.13), chronic kidney disease (OR 2.83; 95% CI: 1.40-5.71) and neoplasia (OR 4.29; 95% CI: 2.40-7.67).

Among the 1,549 hospitalized patients, 65 were readmitted (4.2%): 64.6% were male and 67.7% were 65 years old or older. CFR during readmissions was 10.8% (7/65).

## DISCUSSION

This study describes the COVID-19 series of a secondary level hospital in Madrid, Spain.

During the outbreak, hospital wards almost doubled their capacity (702/361), with the number of patients in ICU quadrupling its capacity (32/8). Beds were brought from other hospitals (antique not working hospitals) to turn single rooms into double rooms

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3 and to make surge beds in large waiting room areas, which became ward beds. A  
4 cohort system (confirmed cases located together and patients with similar suspect  
5 degree too) was followed during the early stages of the epidemic in order to avoid  
6 hospital transmission. Some weeks after the beginning of the pandemic the Gym used  
7 for patient's rehabilitation, was transformed into a semi-critical unit where patients  
8 discharged from the ICU or patients needing closer monitoring or High Flow Oxygen  
9 were admitted. The ordinary activity in consultations and elective surgery was  
10 canceled, the pediatric emergencies were referred to other hospitals and all doctors  
11 attended patients with COVID-19 exclusively. All physicians and nursing staff were  
12 organized into two groups: the COVID Assistance group, led by the internal medicine  
13 department: they attended COVID-19 patients; and the COVID Non-Assistance group  
14 which gave all the administrative support: requesting laboratory tests, writing clinical  
15 reports, informing about clinical evolution to patient's relatives, etc. Regarding Critical  
16 Care beds: our hospital regular capacity comprises 8 beds for ICU, and 6 for the  
17 Surgical Critical Care. Surge critical care beds were made available in the Post  
18 Anesthesia Care Unit (6 beds) and the Outpatient Surgery Post-Anesthesia Care Unit  
19 (12 beds), to a maximum of 32 critical care beds.

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43 Patients baseline characteristics were similar to the largest published series in Spain  
44 (10), although our patients were older and with a higher proportion of males compared  
45 to other tertiary Spanish hospital series (9).

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50 We found that younger patients showed a high incidence of fever, cough, headache,  
51 muscle pain and diarrhea, whereas older patients showed a less specific clinical  
52 presentation. Other studies did not find differences in clinical presentation related to  
53 age (14). This information could be crucial for the rapid identification and isolation of  
54 the suspected cases at any healthcare level.  
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3 Our cohort showed a high incidence of acute kidney failure during hospitalization  
4 similar to other non-Spanish series (15,16) but higher than other Madrid series (9),  
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6 with no association to drug administration. This could be explained for the rapid  
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8 hydroelectrolytic imbalance in older patients in the context of an acute systemic viral  
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10 disease. We also found a high incidence of thrombotic events (6.7%) comparable to  
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12 previous reports (17), although disseminated intravascular coagulation was rare.  
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17 Lopinavir/ritonavir-based treatments were more frequently used in older patients. This  
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19 finding is due to the use of this drug as standard treatment in our hospital protocol  
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21 during the first half of the outbreak, when most of the patients were older than 65.  
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23 Tocilizumab, with or without corticosteroids, was used following Spanish Drug Agency  
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25 recommendations in patients who developed cytokine release storm (CRS) which is  
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27 believed to cause acute respiratory distress syndrome (ARDS), although  
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29 corticosteroids were also used in others clinical contexts.  
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34 During the study, criteria for ICU admission was the need for mechanical ventilation.  
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36 Due to the number of ICU beds made available for the number of patients admitted to  
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38 hospital, which doubled the usual hospital capacity, during the study period 22 patients  
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40 were transferred to other ICUs of Madrid, to make ILUH's ICU beds available for other  
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42 patients. In the same way, due to the scarce ICU bed capacity, triage of patients had  
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44 to be done. The selection for ICU admission opportunity was made individually, based  
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46 on each patient's comorbidities, functional capacity, age (never solely age as a criteria)  
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48 and depending on the availability of critical care beds at the moment. A local guideline  
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50 for patient admission on critical care unit was made, based on the consensus  
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52 document released by the Spanish Society of Intensive and Critical Care (SEMICYUC)  
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54 and other 17 medical societies (18). On the other hand, Non Invasive Mechanical  
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3 Ventilation or High Flow Oxygen, managed by pneumologists, was available in the  
4 ward for selected patients not admitted to ICU  
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8 Our findings in the ICU analysis in patients under 65 years old were analogous to other  
9 studies (16,19,20) in terms of clinical characteristics and laboratory values. As  
10 described in the New York series (16), it seems that obesity and OSAS were related  
11 factors leading to ICU admission, even more than the presence of a previous  
12 pulmonary disease. This could suggest that patients with a baseline ventilatory  
13 compromise could entail a higher risk for ICU admission due to alveolar  
14 hypoventilation and acute-on-chronic hypercapnic respiratory failure. However, this  
15 analysis has some limitations related to scarce availability of ICU resources in our  
16 center and the number of ICU patients who were transferred to other hospitals.  
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30 The CFR in our series was 21.2%. It has probably been overestimated due to a  
31 significant proportion of patients transferred to other hospitals in the first 48 hours, who  
32 had a less severe disease. Some published series showed a lower CFR (21), although  
33 others reported a similar (9,10,16) or even higher CFR (15,22). The differences could  
34 be related to demographic factors, different hospital admission criteria, case definition  
35 and healthcare system overload level (23). It is interesting to note that the CFR found  
36 in our study is similar to other Spanish tertiary level hospitals (9), despite our sample  
37 had a higher proportion of older and male patients and our center had a lower  
38 proportion of conventional hospitalization and ICU beds availability. The CFR in our  
39 ICU was slightly lower than other studies (16). Our CRF similar to other hospitals with  
40 greater capacity could be related to a better reorganization of spaces and resources.  
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Some areas of the hospital were reoriented to attend COVID-19 patients like pediatric  
or anesthesia areas. Comparing the patients who died in the first 48 hours (48/296)  
with the rest of the deceased, the median age was higher and the median days from



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3 symptom onset until fatality was lower. This could reflect a steep clinical deterioration  
4 in older patients compared to younger patients. Further studies are required to support  
5 the evidence of a severe clinical phenotype of SARS-CoV-2 infection characterized by  
6 a quick progression of an acute respiratory failure with severe hypoxemia in older  
7 patients that leads to fatal outcome.  
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11 We found similarities with other series (24) about variables associated to fatality in the  
12 univariate analysis, such as hypertension, cardiovascular disease or pulmonary  
13 diseases. Nevertheless, after adjusting by sociodemographic variables and  
14 comorbidities at admission, risk factors related to death were age, male gender,  
15 neurological disease, chronic kidney disease and cancer. These findings are  
16 consistent with other studies that identify male sex and age as important predictors for  
17 mortality (25). However, this analysis has some limitations because it only focuses in  
18 hospitalized patients skewing estimates of the morbi-mortality and risk factors of  
19 COVID-19 globally (11).  
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37 The strength of this study lies on the sequential collection of patients (all COVID-19  
38 patients admitted to hospital were included) and on the complete follow-up of all  
39 patients during their entire hospital stay. On the other hand, it also has some  
40 limitations. First, its observational and retrospective nature. Second, some variables  
41 (i.e. anosmia and history of thromboembolic event) have a relatively large number of  
42 missing values because they were not registered from the beginning of the study, due  
43 to changes in the evidence related to COVID-19 during the progression of the  
44 pandemic. Third, there is no follow-up after hospital discharge, so only in-hospital  
45 fatality can be estimated.  
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3 We are now attending a second outbreak of COVID-19 in Madrid. Compared to the  
4 first outbreak, the speed of community transmission is lower, the case detection  
5 capacity is higher, there is more knowledge of the disease and the possible treatments  
6 and healthcare settings are better prepared. All these factors will probably have a great  
7 impact on the analysis if the study were to be repeated now. Future analysis comparing  
8 results from first and consecutive waves of COVID-19 pandemic at ILUH would be  
9 interesting to make.  
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## 23 **CONCLUSION**

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26 This study describes the epidemic progression, clinical characteristics, complications  
27 and outcomes of COVID-19 patients attended in a secondary level hospital in one of  
28 the highest COVID-19 incidence neighborhoods of Madrid, which turned into an entire  
29 COVID-19 center and almost doubled its bed capacity, during the first wave of COVID-  
30 19 pandemic in Spain. Fatal outcomes were similar to those reported by hospitals with  
31 a higher level of complexity.  
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## 26 FOOTNOTES

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29 • **Contributors:** EJ, MFV, JV, IFJ, PR and MPB conceived the study idea. EJ,  
30  
31 MFV, JV, IFJ, PR, MPB, EAA, EIG and AL contributed to the study design. EJ,  
32  
33 MFV, IFJ, PR, EAA, EIG, AL and EG performed the data collection. MFV and  
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35 EJ performed the analysis. EJ, MFV, JV, IFJ, PR, MPB, EAA, EIG and AL  
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37 drafted the first version of the manuscript. EJ, MFV, JV, IFJ, MPB, PR, EG,  
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41 manuscript and approved the final version. All authors meet the ICMJE criteria  
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- **Ethics approval:** The Institutional Review Board of Infanta Leonor University Hospital approved this study (Code ILUH R 027-20)) and due to the retrospective nature, they waived the need for informed consent from patients.
- **Reporting guidelines:** The STROBE statement guidelines were followed in the conduct and reporting of the study.
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- **Data availability statement:** All data relevant to the study are included in the article or uploaded as supplementary information. Extra data is available by emailing [ejgonzalezbuitrago@salud.madrid.org](mailto:ejgonzalezbuitrago@salud.madrid.org).

## REFERENCES

1. Gorbalenya AE, Baker SC, Baric RS, de Groot RJ, Drosten C, Gulyaeva AA, et al. The species Severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. *Nat Microbiol.* 2020;5(4):536–44.
2. World Health Organization (WHO). Coronavirus disease (COVID-19) Situation Report-129. Available at: [https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200528-covid-19-sitrep-129.pdf?sfvrsn=5b154880\\_2](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200528-covid-19-sitrep-129.pdf?sfvrsn=5b154880_2) Accessed 31 May 2020.
3. World Health Organization (WHO). Novel Coronavirus (2019-nCoV) Situation Report 12. Available at: <https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200201-sitrep-12->

- 1  
2  
3 ncov.pdf?sfvrsn=273c5d35\_2. Accessed 02 May 2020.  
4  
5  
6 4. Ministerio de Sanidad. Gobierno de España. Análisis epidemiológico COVID  
7  
8 19 . España. Available at:  
9  
10 [https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nC](https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov-China/situacionActual.htm)  
11  
12 [ov-China/situacionActual.htm](https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov-China/situacionActual.htm) Accessed 02 May 2020.  
13  
14  
15  
16 5. Ministerio de Sanidad. Centro de Coordinación de Alertas y Emergencias  
17  
18 Sanitarias. Actualización nº 197. Enfermedad por el coronavirus (COVID-19).  
19  
20 01.09.2020 Available  
21  
22 at:[https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasAct](https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasActual/nCov/documentos/Actualizacion_197_COVID-19.pdf)  
23  
24 [ual/nCov/documentos/Actualizacion\\_197\\_COVID-19.pdf](https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasActual/nCov/documentos/Actualizacion_197_COVID-19.pdf) Accessed 05  
25  
26  
27 September 2020.  
28  
29  
30 6. Ministerio de Sanidad. Centro de Coordinación de Alertas y Emergencias  
31  
32 Sanitarias. Actualización no 119. Enfermedad por el coronavirus (COVID-19).  
33  
34 28.05.2020. Available at:  
35  
36  
37 [https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasActual/](https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasActual/nCov-China/documentos/Actualizacion_119_COVID-19.pdf)  
38  
39 [nCov-China/documentos/Actualizacion\\_119\\_COVID-19.pdf](https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasActual/nCov-China/documentos/Actualizacion_119_COVID-19.pdf) Accessed 6 June  
40  
41  
42 2020.  
43  
44  
45 7. Comunidad de Madrid. Hospital Universitario Infanta Leonor. Memoria 2018  
46  
47 Available at:  
48  
49 [https://www.comunidad.madrid/sites/default/files/doc/sanidad/memo/hosp-](https://www.comunidad.madrid/sites/default/files/doc/sanidad/memo/hosp-memoria-2018-hinfantaleonor_ok.pdf)  
50  
51 [memoria-2018-hinfantaleonor\\_ok.pdf](https://www.comunidad.madrid/sites/default/files/doc/sanidad/memo/hosp-memoria-2018-hinfantaleonor_ok.pdf) Access 07 June 2020.  
52  
53  
54 8. Comunidad de Madrid. Transparencia. Covid-19-TIA por municipios y distritos  
55  
56 de Madrid. Available at:  
57  
58 [https://datos.comunidad.madrid/catalogo/dataset/covid19\\_tia\\_muni\\_y\\_distritos](https://datos.comunidad.madrid/catalogo/dataset/covid19_tia_muni_y_distritos)  
59  
60

- 1  
2  
3 Accessed 01 June 2020.  
4  
5  
6 9. Borobia A, Carcas A, Arnalich F, Álvarez-Sala R, Monserrat-Villatoro J,  
7  
8 Quintana M, et al. A Cohort of Patients with COVID-19 in a Major Teaching  
9  
10 Hospital in Europe. *J Clin Med* [Internet]. 2020 Jun 4 [cited 2020 Jun  
11  
12 6];9(6):1733. Available from: <https://www.mdpi.com/2077-0383/9/6/1733>  
13  
14  
15  
16 10. Casas Rojo JM, Antón Santos JM, Millán Núñez-Cortés J, Lumbreras Bermejo  
17  
18 C, Ramos Rincón JM, Roy-Vallejo E, et al. Clinical characteristics of patients  
19  
20 hospitalized with COVID-19 in Spain: results from the SEMI-COVID-19  
21  
22 Network. *medRxiv* [Internet]. 2020 Jan 1;2020.05.24.20111971. Available  
23  
24 from:  
25  
26 <http://medrxiv.org/content/early/2020/05/26/2020.05.24.20111971.abstract>  
27  
28  
29  
30 11. Prieto-Alhambra D, Ballo E, Coma-Redon E, Mora N, Aragon M, Prats-Urbe  
31  
32 A, et al. Hospitalization and 30-day fatality in 121,263 COVID-19 outpatient  
33  
34 cases. *medRxiv* [Internet]. 2020 Jan 1;2020.05.04.20090050. Available from:  
35  
36 <http://medrxiv.org/content/early/2020/05/08/2020.05.04.20090050.abstract>  
37  
38  
39  
40 12. Heili-Frades S, Minguez P, Mahillo-Fernandez I, Prieto-Rumeau T, Herrero  
41  
42 Gonzalez A, de la Fuente L, et al. COVID-19 Outcomes in 4712 consecutively  
43  
44 confirmed SARS-CoV2 cases in the city of Madrid. *medRxiv* [Internet]. 2020  
45  
46 Jan 1;2020.05.22.20109850. Available from:  
47  
48 <http://medrxiv.org/content/early/2020/05/25/2020.05.22.20109850.abstract>  
49  
50  
51  
52 13. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research  
53  
54 electronic data capture (REDCap)-A metadata-driven methodology and  
55  
56 workflow process for providing translational research informatics support. *J*  
57  
58 *Biomed Inform* [Internet]. 2009;42(2):377–81. Available from:  
59  
60

- 1  
2  
3 <http://dx.doi.org/10.1016/j.jbi.2008.08.010>  
4  
5  
6 14. Garg S, Kim L, Whitaker M, Cummings C, Holstein R, Prill M, et al. MMWR -  
7 Hospitalization Rates and Characteristics of Patients Hospitalized with  
8 Laboratory-Confirmed Coronavirus Disease 2019 — COVID-NET, 14 States,  
9 March 1–30, 2020 [Internet]. 2019. Available from:  
10 <https://www.cdc.gov/coronavirus/2019-ncov/>  
11  
12  
13  
14  
15  
16  
17  
18 15. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors  
19 for mortality of adult inpatients with COVID-19 in Wuhan, China: a  
20 retrospective cohort study. *Lancet* [Internet]. 2020;6736(20):1–9. Available  
21 from: [http://dx.doi.org/10.1016/S0140-6736\(20\)30566-3](http://dx.doi.org/10.1016/S0140-6736(20)30566-3)  
22  
23  
24  
25  
26  
27  
28 16. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson  
29 KW, et al. Presenting Characteristics, Comorbidities, and Outcomes Among  
30 5700 Patients Hospitalized With COVID-19 in the New York City Area. *JAMA*  
31 [Internet]. 2020 Apr 22; Available from:  
32 <https://jamanetwork.com/journals/jama/fullarticle/2765184>  
33  
34  
35  
36  
37  
38  
39  
40 17. Lodigiani C, Iapichino G, Carenzo L, Cecconi M, Ferrazzi P, Sebastian T, et al.  
41 Venous and arterial thromboembolic complications in COVID-19 patients  
42 admitted to an academic hospital in Milan, Italy. *Thromb Res* [Internet]. 2020  
43 Apr 23;191:9–14. Available from: <https://pubmed.ncbi.nlm.nih.gov/32353746>  
44  
45  
46  
47  
48  
49  
50 18. Rubio O, Estella A, Cabre L, Saralegui-Reta I, Martin MC, Zapata L, et al.  
51 Ethical recommendations for a difficult decision-making in intensive care units  
52 due to the exceptional situation of crisis by the COVID-19 pandemic: A rapid  
53 review & consensus of experts. *Med Intensiva* [Internet]. 2020;20(S0210-  
54 5691):30110–8. Available from: <https://doi.org/10.1016/j.medin.2020.04.006>  
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19. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China. *JAMA* [Internet]. 2020 Mar 17 [cited 2020 Jun 6];323(11):1061. Available from: <https://jamanetwork.com/journals/jama/fullarticle/2761044>
  20. Grasselli G, Zangrillo A, Zanella A, Antonelli M, Cabrini L, Castelli A, et al. Baseline Characteristics and Outcomes of 1591 Patients Infected With SARS-CoV-2 Admitted to ICUs of the Lombardy Region, Italy. *Jama* [Internet]. 2020;1–8. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/32250385>
  21. Gold JAW, Wong KK, Szablewski CM, Patel PR, Rossow J, Silva J, et al. Characteristics and clinical outcomes of adult patients hospitalized with COVID-19 — Georgia, March 2020. *Morb Mortal Wkly Rpt*. 2020;69(18):1–6.
  22. Docherty AB, Harrison EM, Green CA, Hardwick HE, Pius R, Norman L, et al. Features of 16,749 hospitalised UK patients with COVID-19 using the ISARIC WHO Clinical Characterisation Protocol. *medRxiv* [Internet]. 2020 Jan 1;2020.04.23.20076042. Available from: <http://medrxiv.org/content/early/2020/04/28/2020.04.23.20076042.abstract>
  23. Liang WH, Guan WJ, Li CC, Li YM, Liang HR, Zhao Y, et al. Clinical characteristics and outcomes of hospitalised patients with COVID-19 treated in Hubei (epicenter) and outside Hubei (non-epicenter): A Nationwide Analysis of China. *Eur Respir J*. 2020 Apr 8;
  24. Chen T, Wu D, Chen H, Yan W, Yang D, Chen G, et al. Clinical characteristics of 113 deceased patients with coronavirus disease 2019: retrospective study. *BMJ* [Internet]. 2020;368(December 2019):m1091. Available from:



1  
2  
3 <http://dx.doi.org/doi:10.1136/bmj.m1091>  
4  
5

- 6 25. Williamson E, Walker AJ, Bhaskaran KJ, Bacon S, Bates C, Morton CE, et al.  
7  
8 OpenSAFELY: factors associated with COVID-19-related hospital death in the  
9  
10 linked electronic health records of 17 million adult NHS patients. medRxiv  
11  
12 [Internet]. 2020 Jan 1;2020.05.06.20092999. Available from:  
13  
14 <http://medrxiv.org/content/early/2020/05/07/2020.05.06.20092999.abstract>  
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#### 24 **LIST OF IMAGES:**

25  
26  
27 Figure 1. Epidemic curve of COVID-19 confirmed cases seen at ILUH

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29 Figure 2. Population flow chart  
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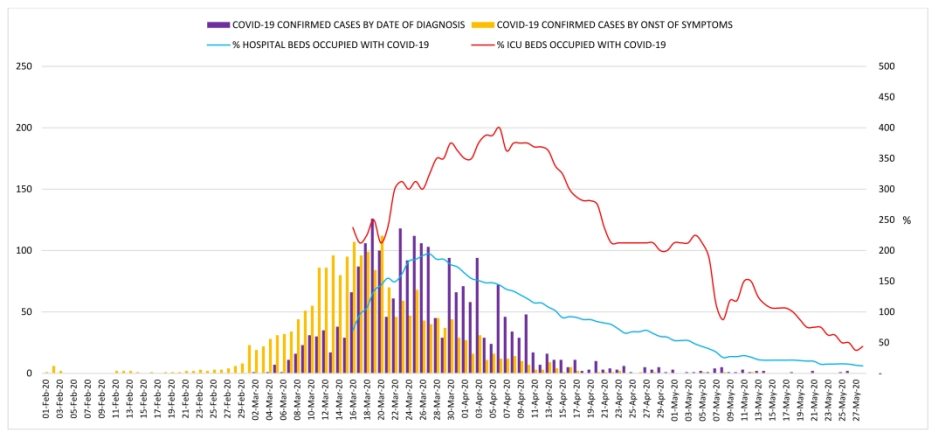
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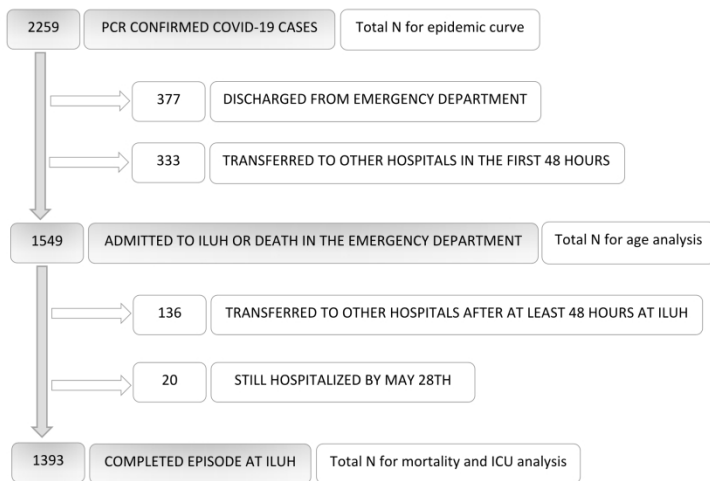
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## Characteristics, Complications and Outcomes Among 2259 Patients Hospitalized with COVID-19 in a Secondary Level Hospital in Madrid, Spain

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	Yes <i>Pag 1-2</i>
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	Yes <i>Pag 1-2</i>
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Yes <i>Pag 3-4</i>
Objectives	3	State specific objectives, including any prespecified hypotheses	Yes <i>Pag 4</i>
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	Yes <i>Pag 5</i>
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Yes <i>Pag 5</i>
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	Yes <i>Pag 5</i>
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Yes <i>Pag 5-6</i>
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Yes <i>Pag 5-6</i>
Bias	9	Describe any efforts to address potential sources of bias	Yes <i>Pag 5-6</i>
Study size	10	Explain how the study size was arrived at	Yes <i>Pag 6</i>
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Yes <i>Pag 6</i>

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Statistical methods

- 12 (a) Describe all statistical methods, including those used to control for confounding
- (b) Describe any methods used to examine subgroups and interactions
- (c) Explain how missing data were addressed
- (d) *Cohort study*—If applicable, explain how loss to follow-up was addressed
- Case-control study*—If applicable, explain how matching of cases and controls was addressed
- Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
- (e) Describe any sensitivity analyses

<b>Yes</b> <b>Pag 6</b>
<b>Yes</b> <b>Pag 6</b>

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<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	<i>Yes</i> <i>Pag 7</i>
		(b) Give reasons for non-participation at each stage	<i>Yes</i> <i>Fig 2</i>
		(c) Consider use of a flow diagram	<i>Yes</i> <i>Fig 2</i>
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	<i>Yes</i> <i>Pag 7-10</i> <i>Fig 1</i> <i>Tables 1-3</i>
		(b) Indicate number of participants with missing data for each variable of interest	<i>Yes</i> <i>Tables 1-3</i>
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	<i>Yes</i> <i>Pag 9</i> <i>Fig 1</i>
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	<i>Yes</i> <i>Pag 9</i> <i>Table 3</i>
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	<i>Yes</i> <i>Pag 7-10</i> <i>Tables 1-3</i>
		(b) Report category boundaries when continuous variables were categorized	<i>Yes</i> <i>Pag 7-10</i> <i>Tables 1-3</i>
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	<i>Yes</i> <i>Pag 9</i> <i>Uni/multivariate</i>
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	<i>Yes</i> <i>Pag 10-12</i>
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	<i>Yes</i> <i>Pag 10-12</i>
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	<i>Yes</i> <i>Pag 10-12</i>
Generalisability	21	Discuss the generalisability (external validity) of the study results	<i>Yes</i> <i>Pag 12</i>

**Other information**

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	<i>Yes</i> <i>Pag 14</i>
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\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

# BMJ Open

## Characteristics, Complications and Outcomes Among 1,549 Patients Hospitalized with COVID-19 in a Secondary Hospital in Madrid, Spain: a Retrospective Case Series Study

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2020-042398.R2
Article Type:	Original research
Date Submitted by the Author:	20-Oct-2020
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<b>Primary Subject Heading</b>:	Epidemiology
Secondary Subject Heading:	Infectious diseases, Public health
Keywords:	INFECTIOUS DISEASES, PUBLIC HEALTH, Epidemiology < INFECTIOUS DISEASES, COVID-19

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3 **Characteristics, Complications and Outcomes Among 1,549 Patients**  
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6 **Hospitalized with COVID-19 in a Secondary Hospital in Madrid,**  
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8 **Spain: a Retrospective Case Series Study**  
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56 **the end of the document.**  
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3 **KEYWORDS:** COVID-19, secondary-level hospital, epidemiology.  
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6 **ABSTRACT**  
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9 **Objectives:** to describe demographic, clinical, radiological and laboratory  
10 characteristics, as well as outcomes, of patients admitted for COVID-19 in a secondary  
11 hospital. **Design and setting:** Retrospective case series of sequentially hospitalized  
12 patients with confirmed SARS-CoV-2, at Infanta Leonor University Hospital (ILUH) in  
13 Madrid, Spain. **Participants:** All patients attended at ILUH testing positive to RT-PCR  
14 on nasopharyngeal swabs and diagnosed with COVID-19 between 1 March 2020 and  
15 28 May 2020. **Results:** A total of 1,549 COVID-19 cases were included (median age  
16 69 [IQR 55.0- 81.0], 57.5% male). 78.2% had at least one underlying comorbidity, the  
17 most frequent was hypertension (55.8%). Most frequent symptoms at presentation  
18 were fever (75.3%), cough (65.7%) and dyspnea (58.1%). 81 (5.8%) patients were  
19 admitted to the intensive care unit (ICU) (median age 62 [IQR 51-71]; 74.1% male;  
20 median length of stay 9 days [IQR 5-19]) 82.7% of them needed invasive ventilation  
21 support. 1393 patients had an outcome at the end of the study period (case fatality  
22 ratio: 21.2% (296/1,393)). The independent factors associated with fatality (OR; 95%  
23 CI): age (1.07; 1.06-1.09), male sex (2.86; 1.85-4.50), neurological disease (1.93;  
24 1.19-3.13), chronic kidney disease (2.83; 1.40-5.71) and neoplasia (4.29; 2.40-7.67).  
25 The percentage of hospital beds occupied with COVID-19 almost doubled (702/361),  
26 with the number of patients in ICU quadrupling its capacity (32/8). Median length of  
27 stay was 9 days (IQR 6-14). **Conclusions:** This study provides clinical characteristics,  
28 complications and outcomes of COVID-19 patients admitted to a European secondary  
29 hospital. Fatal outcomes were similar to those reported by hospitals with a higher level  
30 of complexity.  
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**STRENGTHS AND LIMITATIONS OF THIS STUDY**-This is a large retrospective case series study of 1549 sequentially hospitalized patients with confirmed SARS-CoV-2.

-The study describes the response of a secondary hospital based in a region of Spain with the highest incidence of COVID-19, and how the hospital was transformed into a center entirely dedicated to COVID-19.

-A complete follow-up was made of all patients during hospital stay, although after discharge no outcome information was collected, so only in-hospital fatality could be estimated.

## BACKGROUND

In December 2019, a novel coronavirus (severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2]) emerged in China and spread globally, causing a new infectious disease named “coronavirus disease 2019” (COVID-19) (1). By 28 May 2020, the epidemic reaches 5,593,631 confirmed cases and more than 353,334 deaths across 216 countries all over the world (2).

The first confirmed case of COVID-19 in Spain was reported from La Gomera (Canary Islands) on 31 January 2020 (3). But it was not until the last week of February 2020 when the first five cases were reported in the Community of Madrid (4).

During March and April 2020 (first COVID-19 wave in Spain and Europe), Spain had been one of the most affected countries by the coronavirus, being one of the main



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3 outbreaks of the disease worldwide. Spain, is now the second country in Europe with  
4 the highest number of confirmed cases (after the Russian Federation) with 470.973  
5 cases as of 1 September 2020 (2,5,6). The rate of infections in the Community of  
6 Madrid has exceeded every other region in Spain, with more than 27% of all confirmed  
7 cases in Spain and an accumulated number of 45,074 hospitalized patients and 8,662  
8 deaths as of 1 September 2020 (5).

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10 Hospitals of the various regional health services of Spain are categorized into different  
11 complexity levels depending on their size, technological resources and the higher or  
12 lower availability of different clinical departments, thus, in ascending order of  
13 complexity we have primary, secondary and tertiary level hospitals; tertiary hospitals  
14 often have specific clinical departments that attend patients coming from different parts  
15 of the country. The Infanta Leonor University Hospital (ILUH) is a secondary level  
16 hospital with 361 beds, including 8 in the intensive care unit (ICU). It serves the  
17 population of Vallecas (305,262 individuals) (7). Our healthcare area has a  
18 disproportionate number of beds per inhabitants: 1.07 beds per 1000 people  
19 compared to 2.15 beds per 1000 people overall within the region. Vallecas is one of  
20 the COVID-19 most affected areas in the city of Madrid (Spain) with 9,947 total  
21 confirmed COVID-19 cases as of 1 September 2020 (8). Therefore, the level of  
22 hospital saturation during the epidemic has been one of the greatest in Spain. As a  
23 consequence, the hospital was in March transformed into a center entirely dedicated  
24 to COVID-19 and all its professionals focused on assisting patients affected by the  
25 SARS-CoV-2 infection.

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27 Limited information is available to describe characteristics, complications and mortality  
28 in COVID-19 overloaded secondary Spanish hospitals. The available data from Spain  
29 refer to tertiary hospitals, multi-centric studies or primary care settings (9–12).

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3 This study describes the clinical characteristics, severity, types of treatments and  
4 overall outcomes of patients with confirmed SARS-CoV-2 infection admitted to ILUH  
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6 in Madrid (Spain).  
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## 10 11 12 13 **METHODS**

### 14 15 16 **Study design and participants:**

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19 A single-center retrospective observational study that included patients attended at  
20 ILUH with a laboratory-confirmed COVID-19 between 1 March 2020 and 28 May 2020.  
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22 SARS-CoV-2 infection was confirmed by real-time reverse transcriptase–polymerase  
23 chain reaction (RT-PCR) assay (FTD SARS-CoV-2 Assay by SIEMENS) from  
24 nasopharyngeal swabs (Deltaswab by Deltalab). Patients discharged from the  
25 emergency department and those transferred to another hospital in the first 48 hours  
26 were not included in the final analysis; although these patients were hospitalized at  
27 ILUH, they didn't stay enough time to record all the relevant clinical data due to the  
28 hospital overcapacity context. Once selected patients that met inclusion criteria, no-  
29 one was excluded.  
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44 Epidemiological and demographic data, medical history, baseline comorbidities,  
45 symptoms and signs both at admission and during follow-up, laboratory findings, RT-  
46 PCR results, treatment strategy used for COVID-19, complications and survival data  
47 were obtained from patient's electronic medical records. All-cause mortality was  
48 calculated including deaths occurred both in patients pending admission (first 48  
49 hours) and during hospitalization. ICU admission, hospitalization length of stay and  
50 ventilatory support (invasive mechanical ventilation, noninvasive mechanical  
51 ventilation or oxygen mask) were also registered. Different time intervals were  
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3 calculated: lag time between symptoms onset and diagnosis, length of stay at ICU  
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5 and overall length of stay at the hospital.  
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8 Data were collected and managed using REDCap electronic data capture tools hosted  
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10 at Ideas for Health Association. REDCap (Research Electronic Data Capture) is a  
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12 secure, web-based software platform designed to support data capture for research  
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14 studies (13).  
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18 The STROBE statement guidelines were followed in the conduct and reporting of the  
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20 study (see Supplementary files).  
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### 23 **Patient and Public Involvement:**

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26 There was no patient or public involvement in the development of the research  
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28 design or in conducting the study.  
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### 31 **Statistical Analysis:**

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34 A descriptive analysis of the clinical background and baseline characteristics of the  
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36 patients was performed. Continuous variables are presented as median and  
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38 interquartile range (IQR), after testing normal distribution. Categorical variables are  
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40 expressed as number of patients and percentage. Two age-groups were defined using  
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42 a cut off value of 65 (<65 and ≥65 years old) for the comparison of the clinical  
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44 characteristics of the cohort. For the ICU analysis, the comparison of the  
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46 characteristics between admitted and non-admitted to ICU patients were limited to  
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48 patients under 65 because age was one of the major criteria for a better allocation of  
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50 ICU resources in a context of limited availability of them.  
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56 For the mortality analysis, the case fatality ratio (CFR) was defined as number of  
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58 deaths of laboratory-confirmed COVID-19 patients divided by the number of  
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laboratory-confirmed COVID-19 cases admitted to the hospital. The outcomes were defined as death or recovered, and the clinical characteristics between these groups were compared using Chi-square test for the categorical variables and Median test for the quantitative variables.

Logistic regression analysis was carried out to ascertain the effect of sociodemographic and clinical background characteristics on mortality. Variables that showed statistical significance ( $p < 0.05$ ) in the univariate analysis and clinical variables that could have potential relevance on the outcome according to the current available evidence were included in the model. Odds Ratio (OR) and 95% confidence intervals (95% CI) were calculated.

Statistical analyses were done using Stata software (version 14.0; Stata Corporation, College Station, Texas, USA).

### **Ethical aspects:**

The Institutional Investigation and Ethics Review Board of Infanta Leonor University Hospital (CEI-ILUH) approved the study (Code ILUH R 027-20) and due to its retrospective nature, the need for informed consent from patients was waived.

## **RESULTS**

Overall, 2,259 COVID-19 confirmed cases were attended at ILUH during the study period. The daily number of confirmed COVID-19 cases are plotted by the date of diagnosis (date of positive RT-PCR) and by the date of symptoms onset in **Figure 1**. The first positive patient in our hospital was diagnosed on 1 March 2020 and the epidemic curve peaked on 19 March when 126 PCR tested positive. From that date,

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3 the incidence declined gradually but it took over a month to have a daily number of  
4 new cases below 10. The percentage of ICU beds and total hospital beds occupied  
5 with COVID-19 patients are shown in **Figure 1**. On 27 March, our hospital almost  
6 doubled its bed capacity with 702 hospitalized patients. On 6 April, 32 patients were  
7 in ICU, reaching 400% of hospital ICU capacity.  
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15 Among these 2,259 patients, we analyzed 1,549 cases and excluded 710 because  
16 they were discharged from the emergency department or transferred to other hospitals  
17 in the first 48 hours. For the complications, ICU and mortality analysis, 156 patients  
18 with an uncomplete episode were excluded because they were transferred to other  
19 hospitals during their stay or were still hospitalized by 28 May 2020 (**Figure 2**).  
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27 Age range of the 1,549 hospitalized patients varied from 3 weeks to 102 years old,  
28 median was 69 (IQR 55.0-81.0), and 57.5% were male. All patients except for the  
29 three-week-old baby were adults. 55.0% had hypertension, 24.8% diabetes, 24.3%  
30 cardiovascular disease, 15.7% obesity, 13.7% chronic obstructive pulmonary disease  
31 (COPD) and 8.5% obstructive sleep apnea syndrome (OSAS). HIV infection (0.6%)  
32 and autoimmune disease (5.2%) were rare. Overall, 1,221 (78.2%) patients had at  
33 least one underlying comorbidity.  
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44 The median lag time between symptoms onset and diagnosis was 7 days (IQR: 4-9)  
45 (**Figure 1**). The commonest symptoms at presentation were fever (75.3%), cough  
46 (65.7%) and dyspnea (58.1%). Diarrhea (17.6%) and anosmia (3.6%) were less  
47 common in our case series. Fever, headache, cough, diarrhea, nausea/vomiting,  
48 anosmia, muscle or chest pain were more frequent in younger patients while cognitive  
49 deterioration was in older patients (**Table 1**).  
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Table 1. Clinical characteristics and treatment (N= 1549)				
	Overall	< 65 y.o.	≥ 65 y.o.	
	n/N (%)	n/N (%)	n/N (%)	p-value
Male	890/1549 (57.5)	400/642 (62.3)	490/907 (54.0)	0.001
Migrant	385/1549 (24.8)	296/642 (46.1)	89/642 (13.9)	<0.001
<b>Clinical background</b>				
Influenza vaccine 19/20	498/1101 (45.2)	90/463 (19.4)	408/638 (63.9)	<0.001
Cardiological disease	375/1545 (24.3)	37/640 (5.8)	338/905 (37.3)	<0.001
High blood pressure	851/1548 (55.0)	185/641 (28.9)	666/907 (73.4)	<0.001
Diabetes mellitus	382/1541 (24.8)	85/636 (13.4)	297/905 (32.8)	<0.001
Tobacco smoker/ex-smoker	374/1344 (27.8)	121/555 (21.8)	253/789 (32.0)	<0.001
Obesity	240/1531 (15.7)	110/636 (17.3)	130/895 (14.5)	0.129
COPD	211/1541 (13.7)	37/638 (5.8)	174/903 (19.3)	<0.001
Asthma	122/1545 (7.9)	51/639 (8.0)	71/906 (7.8)	0.668
OSAS	79/935 (8.4)	32/401 (8.0)	47/534 (8.8)	0.654
Cerebrovascular disease	57/125 (45.6)	12/28 (42.7)	45/97 (46.4)	0.741
Thromboembolic disease	41/939 (4.4)	10/410 (2.4)	31/529 (5.9)	0.011
Neurological disease	178/1540 (11.6)	37/637 (5.8)	141/903 (15.6)	<0.001
Chronic kidney disease	104/1543 (6.7)	16/639 (2.5)	88/904 (9.7)	<0.001
Cirrhosis	28/1540 (1.8)	13/638 (2.0)	15/902 (1.7)	0.209
Haematological/oncological cancer	103/1540 (6.7)	21/640 (3.3)	82/900 (9.1)	<0.001
HIV	9/1542 (0.6)	7/639 (1.1)	2/903 (0.2)	0.012
Autoimmune disease	47/913 (5.1)	17/393 (4.3)	30/520 (5.8)	0.328
<b>Symptoms</b>				
Fever	1159/1540 (75.3)	533/638 (83.5)	626/902 (69.4)	<0.001
Headache	133/1533 (8.7)	92/634 (14.5)	41/899 (4.6)	<0.001
Malaise	671/1533 (43.8)	282/637 (44.3)	389/896 (43.3)	0.928
Confused	87/1532 (5.7)	11/633 (1.7)	76/899 (8.4)	<0.001
Dyspnea	891/1533 (58.1)	362/632 (57.3)	529/901 (58.7)	0.382
Superior respiratory tract symptoms	316/1534 (20.6)	153/635 (24.1)	163/899 (18.1)	0.009
Cough	1010/1538 (65.7)	469/638 (73.5)	541/900 (60.1)	<0.001
Expectoration	194/1535 (12.6)	69/635 (10.9)	125/900 (13.9)	0.167
Hemoptysis	26/1532 (1.7)	15/633 (2.3)	11/899 (1.2)	0.207
Chest pain	134/1534 (8.7)	79/635 (12.4)	55/899 (6.1)	<0.001
Muscle pain	291/1534 (19.0)	166/635 (26.1)	125/899 (13.9)	<0.001
Abdominal pain	49/1534 (3.19)	16/635 (2.52)	33/899 (3.67)	0.280
Nausea/vomiting	178/1532 (11.6)	88/636 (13.8)	90/896 (10.0)	0.040
Diarrhea	269/1530 (17.6)	143/636 (22.5)	126/894 (14.1)	<0.001
Skin rash	8/1531 (0.5)	5/636 (0.8)	3/895 (0.3)	0.087
Anosmia	41/1153 (3.6)	29/489 (5.9)	12/664 (1.8)	<0.001
<b>Complications during admission</b>				
Bacterial pneumonia	43/1362 (3.2)	13/551 (2.4)	30/811 (3.7)	0.320
Sepsis	28/1372 (2.0)	16/554 (2.9)	12/818 (1.5)	0.054
Respiratory distress syndrome	195/1368 (14.2)	74/550 (13.4)	121/818 (14.8)	0.557
Pneumothorax	5/1373 (0.4)	3/556 (0.5)	2/817 (0.2)	0.488
Pleural effusion	29/1367 (2.1)	6/552 (1.1)	23/815 (2.8)	0.032

Stroke	11/1373 (0.8)	4/555 (0.7)	7/818 (0.9)	0.669
Disseminated intravascular coagulation	9/1369 (0.7)	2/554 (0.4)	7/815 (0.9)	0.360
Thrombosis	55/824 (6.7)	23/338 (6.8)	32/486 (6.6)	0.833
Acute renal failure	165/1373 (12.0)	37/556 (6.6)	128/817 (15.7)	<0.001
<b>Treatment</b>				
HCQ monotherapy	28/1549 (1.8)	7/642 (1.1)	21/907 (2.3)	0.075
HCQ + AZ	927/1549 (59.8)	448/642 (69.8)	479/907 (52.8)	<0.001
HCQ + LP/r	98/1549 (6.3)	32/642 (5.0)	66/907 (7.3)	<0.001
HCQ + AZ + LP/r	287/1549 (18.5)	90/642 (14.0)	197/907 (21.7)	<0.001
HCQ + LP/r + IFN-b	37/1549 (2.4)	12/642 (1.9)	25/907 (2.8)	0.260
HCQ + AZ + LP/r + IFN-b	113/1549 (7.3)	37/642 (5.8)	76/907 (8.4)	0.051
Tocilizumab	240/1549 (15.5)	144/642 (22.4)	96/907 (10.6)	<0.001
Corticosteroids	684/1549 (44.2)	264/642 (41.1)	420/907 (46.3)	<0.001
COPD: Chronic obstructive pulmonary disease; OSAS: obstructive sleep apnea syndrome; ICU: intensive care unit; HCQ: hydroxychloroquine; AZ: azithromycin; LP/r: lopinavir-ritonavir; IFN-b: interferon-beta				

The most frequent therapies used for treating COVID-19 were the combination hydroxychloroquine plus azithromycin (59.9%) and the combination hydroxychloroquine plus azithromycin plus lopinavir-ritonavir (18.5%). Any treatment combination including lopinavir-ritonavir was more frequently used in older patients. Tocilizumab was used in 15.5% of the patients and corticosteroids in 44.2%. (**Table 1**).

The analysis of the complications during admission showed that 14.3% of patients had acute respiratory distress syndrome with no differences between age groups, 12.0% had acute kidney failure which was more frequent in older patients (15.7% vs. 6.7%), 6.7% had a clinical thrombotic event and 0.7% had disseminated intravascular coagulation (**Table 1**).

Among patients with a complete episode at ILUH, 81 were admitted to ICU: median age 62 (IQR 51-71); 74.1% male.; median length of stay 9 days [IQR 5-19] and 82.7% of them needed invasive ventilation support Clinical characteristics are shown in **Table**



2. Among the 575 patients younger than 65 years old with a complete episode at ILUH, risk factors associated to ICU admission in the univariate analysis were: being male, obesity, hypertension, OSAS, high respiratory rate, a low blood oxygen saturation level (SpO<sub>2</sub>) at admission, a high neutrophil/lymphocyte ratio, an elevated plasma INR, lactate dehydrogenase (LDH), aspartate transaminase (AST), creatinine and C-reactive protein and the presence of alveolar pulmonary infiltrates in the chest x-ray. (**Table 2**). We calculated CFR in ICU patients with a complete episode at ILUH (70 patients): global CFR was 72.9% (62.8% in the under 65 group and 88.9% in the older group).

Table 2. Clinical, laboratory and diagnosis imaging characteristics of COVID-19 patients who have been admitted in ICU. Comparison between patients under 65 years of age admitted to ICU vs non-admitted to ICU.				
	ICU patients cohort (n=81)	<65 y. old patients (n=575)		
		Admitted to ICU (n=50)	Non-admitted to ICU (n=525)	p-value
Age <sup>1</sup>	62 (51-71) (N=81)	54 (48-60) (N=50)	53 (45-59) (N=525)	0.625
Male <sup>2</sup>	60/81 (74.1)	21/50 (42.0)	325/525 (61.9)	0.048
Migrant <sup>2</sup>	25/81 (30.9)	21/50 (42.0)	238/525 (45.3)	0.651
Influenza vaccine 19-20 <sup>2</sup>	12/42 (28.6)	5/28 (17.9)	75/395 (19.0)	0.883
<b>Clinical background</b>				
Cardiovascular disease <sup>2</sup>	17/81 (21.0)	6/50 (12.0)	29/523 (5.5)	0.069
High blood pressure <sup>2</sup>	43/81 (53.1)	23/50 (46.0)	147/524 (28.1)	0.008
Diabetes mellitus <sup>2</sup>	23/81 (28.4)	10/50 (20.0)	65/519 (12.5)	0.315
Tobacco smoker/ex-smoker <sup>2</sup>	23/76 (30.3)	13/49 (26.5)	98/450 (21.8)	0.447
Obesity <sup>2</sup>	23/81 (28.4)	17/50 (34.0)	80/520 (15.4)	0.001
COPD <sup>2</sup>	7/81 (8.6)	4/50 (8.0)	30/521 (5.8)	0.522
Asthma <sup>2</sup>	5/81 (6.2)	4/50 (8.0)	43/522 (8.2)	0.117



OSAS <sup>2</sup>	8/39 (20.5)	8/27 (29.6)	22/332 (6.6)	<0.001
Thromboembolic disease <sup>2</sup>	2/40 (5.0)	2/28 (7.1)	8/338 (2.4)	0.136
Neurological disease <sup>2</sup>	5/80 (6.3)	2/49 (4.1)	31/521 (6.0)	0.786
Chronic kidney disease <sup>2</sup>	5/81 (6.2)	3/50 (6.0)	12/522 (2.3)	0.118
Liver cirrhosis <sup>2</sup>	1/80 (1.3)	1/50 (2.0)	11/522 (2.1)	0.117
Haematological/oncological cancer <sup>2</sup>	4/81 (4.9)	1/50 (2.0)	19/523 (3.6)	0.548
HIV <sup>2</sup>	0/81 (0.0)	0/50 (0.0)	7/522 (1.3)	0.529
<b>Clinical and laboratory presentation</b>				
Heart rate, beats per minute <sup>1</sup>	94 (83-107) (N=73)	54 (48-60) (N=50)	53 (45-59) (N=525)	0.625
Respiratory rate, breaths per minute <sup>1</sup>	23 (18-30) (N=44)	24 (18-30) (N=33)	18 (16-20) (N=222)	0.002
Systolic blood pressure, mmHg <sup>1</sup>	133 (119-142) (N=66)	128 (118-141) (N=42)	125 (114-137) (N=292)	0.591
SpO <sub>2</sub> , % <sup>1</sup>	88 (76-93) (N=69)	88 (66-94) (N=44)	96 (92-97) (N=454)	<0.001
SpO <sub>2</sub> <90% <sup>2</sup>	39/81 (48.1)	26/50 (52.0)	53/525 (10.1)	<0.001
SpO <sub>2</sub> after oxygen administration, % <sup>1</sup>	95 (90-97) (N=39)	95 (90-98) (N=27)	96 (94-98) (N=91)	0.813
SpO <sub>2</sub> <90% after oxygen administration <sup>2</sup>	9/81 (11.1)	5/50 (10.0)	0/525 (0.0)	<0.001
Hemoglobin, g/L <sup>1</sup>	13.9 (11.9-15.0) (N=81)	14.1 (12.1-15.2) (N=50)	14.1 (13.1-15.1) (N=493)	0.946
Neutrophils, cells count/ $\mu$ L <sup>1</sup>	6300 (4500-9300) (N=81)	7000 (4600-8800) (N=50)	4700 (3500-6700) (N=495)	0.001
Lymphocytes, cells count/ $\mu$ L <sup>1</sup>	900 (600-1200) (N=81)	900 (700-1300) (N=50)	1100 (800-1400) (N=495)	0.252
Neutrophil/lymphocyte ratio <sup>1</sup>	6.64 (5.0-12.7) (N=81)	6.69 (4.8-12.3) (N=50)	4.4 (2.9-7.1) (N=495)	<0.001
Platelets, $\times 10^9$ /L <sup>1</sup>	209 (170-267) (N=81)	205 (172-265) (N=50)	213 (171-274) (N=495)	0.777
INR <sup>1</sup>	1.1 (1.0-1.2) (N=81)	1.1 (1.0-1.2) (N=50)	1.1 (1.0-1.1) (N=484)	0.035
D-dimer, mg/L <sup>1</sup>	940 (485-2095) (N=56)	790 (470-2350) (N=35)	640 (400-1080) (N=334)	0.163
LDH, U/L <sup>1</sup>	408 (279-542) (N=70)	415 (279-605) (N=43)	271 (215-348) (N=430)	<0.001
ALT, U/L <sup>1</sup>	45 (32-67) (N=80)	50 (34-80) (N=50)	44 (30-66) (N=494)	0.075
AST, U/L <sup>1</sup>	59 (40-82) (N=79)	60 (43-85) (N=50)	40 (29-57) (N=485)	<0.001

Creatinine, mg/dL <sup>1</sup>	1.1 (0.9-1.3) (N=78)	1.1 (1.0-1.3) (N=48)	0.9 (0.7-1.1) (N=480)	<0.001
C-reactive protein, mg/L <sup>1</sup>	1157 (481-2054) (N=80)	1234 (678-2133) (N=49)	522 (174-1152) (N=494)	<0.001
<b>Diagnosis imaging</b>				
Bilateral pulmonary infiltrates <sup>2</sup>	61/74 (82.4)	40/46 (87.0)	388/476 (81.5)	0.359
Interstitial pulmonary infiltrates <sup>2</sup>	61/81 (75.3)	38/50 (76.0)	360/525 (68.6)	0.277
Alveolar pulmonary infiltrates <sup>2</sup>	51/81 (63.0)	33/50 (66.0)	230/525 (43.8)	0.003
<b>Respiratory supplementation</b>				
Oxygen therapy <sup>2</sup>	77/81 (95.1)	47/50 (94.0)	345/516 (66.9)	<0.001
Non-invasive ventilation <sup>2</sup>	38/80 (47.5)	26/49 (53.1)	25/513 (4.9)	<0.001
Invasive ventilation <sup>2</sup>	67/81 (82.7)	43/50 (86.0)	0/514 (0.0)	<0.001
COPD: chronic obstructive pulmonary disease; OSAS: Obstructive sleep apnea syndrome; HIV: Human immunodeficiency virus; SpO <sub>2</sub> : partial oxygen saturation; LDH: Lactate dehydrogenase; AST: aspartate transaminase; ALT: alanine aminotransferase				
<sup>1</sup> continuous variable (median, IQR, N); <sup>2</sup> categorical variables (n/N, %)				

The overall CFR in our cohort was 21.2% (296/1,393 cases). The median length of stay was 9 days (IQR 6-14). Among the 296 deaths, 48 occurred in the first 48 hours and the rest during hospitalization. These 48 patients had a higher median age compared to the global cohort (82.5 vs 69) and their median lag time from symptom onset until fatality was lower (7 days vs 13.5 days,  $p < 0.001$ ). As shown in **Table 3**, patients who died were older and more likely to be male, current smoker/ex-smoker, and had hypertension, cardiovascular disease, COPD, OSAS, diabetes mellitus, neurological disease, chronic kidney disease and neoplasia in the univariate analysis. Also, they received more frequently ventilatory support during hospitalization and showed more alveolar pulmonary infiltrates in chest x-ray than people who recovered.

Table 3. Clinical, laboratory and diagnosis imaging characteristics of COVID-19 patients who died or recovered.			
	<b>Death (n=296)</b>	<b>Recovered (n=1097)</b>	<b>p-value</b>
Age <sup>1</sup>	82 (71.5-87) (N=246)	65 (53-78) (N=1097)	<0.001
Male <sup>2</sup>	208/296 (70.3)	593/1097 (54.1)	<0.001

Migrant <sup>2</sup>	41/296 (13.8)	296/1097 (27.0)	<0.001
<b>Clinical background</b>			
Influenza vaccine 19/20 <sup>2</sup>	113/183 (61.7)	342/820 (41.7)	<0.001
Cardiovascular disease <sup>2</sup>	124/296 (41.9)	217/1093 (19.8)	<0.001
High blood pressure <sup>2</sup>	208/296 (70.3)	565/1096 (51.5)	<0.001
Diabetes mellitus <sup>2</sup>	90/295 (30.5)	260/1090 (23.8)	0.038
Tobacco smoker/exs-smoker <sup>2</sup>	111/260 (42.7)	236/950 (23.8)	<0.001
Obesity <sup>2</sup>	42/292 (14.4)	169/1085 (15.6)	0.169
COPD <sup>2</sup>	67/293 (22.9)	120/1092 (11.0)	<0.001
Asthma <sup>2</sup>	17/296 (5.7)	95/1093 (8.7)	0.166
OSAS <sup>2</sup>	20/156 (12.8)	53/687 (7.7)	0.041
Thromboembolic disease <sup>2</sup>	11/161 (6.8)	26/681 (3.8)	0.093
Neurological disease <sup>2</sup>	59/293 (20.1)	101/1091 (9.3)	<0.001
Chronic kidney disease <sup>2</sup>	40/295 (13.6)	58/1092 (5.3)	<0.001
Liver cirrhosis <sup>2</sup>	8/292 (2.7)	17/1093 (1.5)	0.352
Haematological/oncological cancer <sup>2</sup>	48/293 (16.4)	50/1092 (4.6)	<0.001
HIV <sup>2</sup>	0/295 (0.0)	8/1091 (0.7)	0.327
<b>Clinical and laboratory presentation</b>			
Heart rate, beats per minute <sup>1</sup>	88 (78-102) (N=242)	88 (78-100) (N=881)	0.856
Respiratory rate, breaths per minute <sup>1</sup>	21.5 (16-28) (N=116)	18 (16-20.5) (N=397)	<0.001
Systolic blood pressure, mmHg <sup>1</sup>	130 (111-147) (N=217)	130 (117-143) (N=683)	0.877
SpO <sub>2</sub> , % <sup>1</sup>	89 (82-93) (N=239)	95 (92-97) (N=945)	0.033
SpO <sub>2</sub> <90% <sup>2</sup>	121/203 (59.6)	152/945 (16.1)	<0.001
SpO <sub>2</sub> after oxygen administration, % <sup>1</sup>	94 (90.5-97) (N=112)	96 (94-98) (N=203)	0.003
SpO <sub>2</sub> <90% after oxygen administration <sup>2</sup>	18/112 (16.1)	7/203 (0.1)	<0.001
Hemoglobin, g/L <sup>1</sup>	12.70 (11.00-14.50) (N=292)	13.70 (12.60-14.70) (N=1054)	<0.001
Neutrophils, cells count/ $\mu$ L <sup>1</sup>	6100 (4200-8550) (N=292)	4800 (3500-6800) (N=1057)	<0.001
Lymphocytes, cells count/ $\mu$ L <sup>1</sup>	800 (500-1100) (N=292)	1000 (800-1300) (N=1057)	<0.001
Neutrophil/lymphocyte ratio <sup>1</sup>	7.17 (4.3-12.9) (N=292)	4.67 (3.1-7.4) (N=1057)	<0.001
Platelets, $\times 10^9/L^1$	190 (142.5-263.5) (N=292)	209 (162-273) (N=1057)	0.040
INR <sup>1</sup>	1.1 (1.0-1.3) (N=283)	1.1 (1.0-1.2) (N=1026)	<0.001
D-dimer, mg/L <sup>1</sup>	1060 (570-2560) (N=167)	750 (450-1330) (N=685)	<0.001
LDH, U/L <sup>1</sup>	345 (249-479) (N=235)	259 (210-331) (N=887)	<0.001
ALT, U/L <sup>1</sup>	31 (23-47) (N=287)	36 (25-55) (N=1050)	<0.001

AST, U/L <sup>1</sup>	47 (30-67) (N=284)	38 (28-55) (N=1035)	<0.001
Creatinine, mg/dL <sup>1</sup>	1.2 (0.9-1.7) (N=285)	0.9(0.7-1.2) (N=1032)	<0.001
C-reactive protein, mg/L <sup>1</sup>	105.9 (36.2-182.4) (N=291)	53.8 (18.3-111.4)	<0.001
<b>Diagnosis imaging</b>			
Bilateral pulmonary infiltrates <sup>2</sup>	218/259 (84.2)	762/960 (79.4)	0.084
Interstitial pulmonary infiltrates <sup>2</sup>	182/296 (61.5)	689/1097 (62.8)	0.677
Alveolar pulmonary infiltrates <sup>2</sup>	153/296 (51.7)	458/1097 (41.7)	0.002
<b>Respiratory supplementation</b>			
Oxygen therapy <sup>2</sup>	285/292 (97.6)	458/1075 (76.5)	0.001
Non-invasive ventilation <sup>2</sup>	57/289 (19.7)	64/1072 (6.0)	<0.001
Invasive ventilation <sup>2</sup>	46/292 (15.7)	15/1075 (1.4)	<0.001
COPD: chronic obstructive pulmonary disease; OSAS: obstructive sleep apnea syndrome; HIV: Human immunodeficiency virus; SpO <sub>2</sub> : partial oxygen saturation; LDH: Lactate dehydrogenase; AST: aspartate transaminase; ALT: alanine aminotransferase <sup>1</sup> continuous variable (median, IQR, N); <sup>2</sup> categorical variable (n/N, %)			

In the multivariate analysis, independent factors related to death were: years of age (OR 1.07; 95% CI: 1.06-1.09), being male (OR 2.86; 95% CI: 1.85-4.50), neurological disease (OR 1.93; 95% CI: 1.19-3.13), chronic kidney disease (OR 2.83; 95% CI: 1.40-5.71) and neoplasia (OR 4.29; 95% CI: 2.40-7.67).

Among the 1,549 hospitalized patients, 65 were readmitted (4.2%): 64.6% were male and 67.7% were 65 years old or older. CFR during readmissions was 10.8% (7/65).

## DISCUSSION

This study describes the COVID-19 series of a secondary level hospital in Madrid, Spain.

During the outbreak, hospital wards almost doubled their capacity (702/361), with the number of patients in ICU quadrupling its capacity (32/8). Beds were brought from other hospitals (antique not working hospitals) to turn single rooms into double rooms

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3 and to make surge beds in large waiting room areas, which became ward beds. A  
4 cohort system (confirmed cases located together and patients with similar suspect  
5 degree too) was followed during the early stages of the epidemic in order to avoid  
6 hospital transmission. Some weeks after the beginning of the pandemic the Gym used  
7 for patient's rehabilitation, was transformed into a semi-critical unit where patients  
8 discharged from the ICU or patients needing closer monitoring or High Flow Oxygen  
9 were admitted. The ordinary activity in consultations and elective surgery was  
10 canceled, the pediatric emergencies were referred to other hospitals and all doctors  
11 attended patients with COVID-19 exclusively. All physicians and nursing staff were  
12 organized into two groups: the COVID Assistance group, led by the internal medicine  
13 department: they attended COVID-19 patients; and the COVID Non-Assistance group  
14 which gave all the administrative support: requesting laboratory tests, writing clinical  
15 reports, informing about clinical evolution to patient's relatives, etc. Regarding Critical  
16 Care beds: our hospital regular capacity comprises 8 beds for ICU, and 6 for the  
17 Surgical Critical Care. Surge critical care beds were made available in the Post  
18 Anesthesia Care Unit (6 beds) and the Outpatient Surgery Post-Anesthesia Care Unit  
19 (12 beds), to a maximum of 32 critical care beds.

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43 Patients baseline characteristics were similar to the largest published series in Spain  
44 (10), although our patients were older and with a higher proportion of males compared  
45 to other tertiary Spanish hospital series (9).

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50 We found that younger patients showed a high incidence of fever, cough, headache,  
51 muscle pain and diarrhea, whereas older patients showed a less specific clinical  
52 presentation. Other studies did not find differences in clinical presentation related to  
53 age (14). This information could be crucial for the rapid identification and isolation of  
54 the suspected cases at any healthcare level.  
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3 Our cohort showed a high incidence of acute kidney failure during hospitalization  
4 similar to other non-Spanish series (15,16) but higher than other Madrid series (9),  
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6 with no association to drug administration. This could be explained for the rapid  
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8 hydroelectrolytic imbalance in older patients in the context of an acute systemic viral  
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10 disease. We also found a high incidence of thrombotic events (6.7%) comparable to  
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12 previous reports (17), although disseminated intravascular coagulation was rare.  
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17 Lopinavir/ritonavir-based treatments were more frequently used in older patients. This  
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19 finding is due to the use of this drug as standard treatment in our hospital protocol  
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21 during the first half of the outbreak, when most of the patients were older than 65.  
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23 Tocilizumab, with or without corticosteroids, was used following Spanish Drug Agency  
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25 recommendations in patients who developed cytokine release storm (CRS) which is  
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27 believed to cause acute respiratory distress syndrome (ARDS), although  
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29 corticosteroids were also used in others clinical contexts.  
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34 During the study, criteria for ICU admission was the need for mechanical ventilation.  
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36 Due to the number of ICU beds made available for the number of patients admitted to  
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38 hospital, which doubled the usual hospital capacity, during the study period 22 patients  
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40 were transferred to other ICUs of Madrid, to make ILUH's ICU beds available for other  
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42 patients. In the same way, due to the scarce ICU bed capacity, triage of patients had  
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44 to be done. The selection for ICU admission opportunity was made individually, based  
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46 on each patient's comorbidities, functional capacity, age (never solely age as a criteria)  
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48 and depending on the availability of critical care beds at the moment. A local guideline  
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50 for patient admission on critical care unit was made, based on the consensus  
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52 document released by the Spanish Society of Intensive and Critical Care (SEMICYUC)  
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54 and other 17 medical societies (18). On the other hand, Non Invasive Mechanical  
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3 Ventilation or High Flow Oxygen, managed by pneumologists, was available in the  
4 ward for selected patients not admitted to ICU  
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8 Our findings in the ICU analysis in patients under 65 years old were analogous to other  
9 studies (16,19,20) in terms of clinical characteristics and laboratory values. As  
10 described in the New York series (16), it seems that obesity and OSAS were related  
11 factors leading to ICU admission, even more than the presence of a previous  
12 pulmonary disease. This could suggest that patients with a baseline ventilatory  
13 compromise could entail a higher risk for ICU admission due to alveolar  
14 hypoventilation and acute-on-chronic hypercapnic respiratory failure. However, this  
15 analysis has some limitations related to scarce availability of ICU resources in our  
16 center and the number of ICU patients who were transferred to other hospitals.  
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30 The CFR in our series was 21.2%. It has probably been overestimated due to a  
31 significant proportion of patients transferred to other hospitals in the first 48 hours, who  
32 had a less severe disease. Some published series showed a lower CFR (21), although  
33 others reported a similar (9,10,16) or even higher CFR (15,22). The differences could  
34 be related to demographic factors, different hospital admission criteria, case definition  
35 and healthcare system overload level (23). It is interesting to note that the CFR found  
36 in our study is similar to other Spanish tertiary level hospitals (9), despite our sample  
37 had a higher proportion of older and male patients and our center had a lower  
38 proportion of conventional hospitalization and ICU beds availability. The CFR in our  
39 ICU was slightly lower than other studies (16). Our CRF similar to other hospitals with  
40 greater capacity could be related to a better reorganization of spaces and resources.  
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Some areas of the hospital were reoriented to attend COVID-19 patients like pediatric  
or anesthesia areas. Comparing the patients who died in the first 48 hours (48/296)  
with the rest of the deceased, the median age was higher and the median days from



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3 symptom onset until fatality was lower. This could reflect a steep clinical deterioration  
4 in older patients compared to younger patients. Further studies are required to support  
5 the evidence of a severe clinical phenotype of SARS-CoV-2 infection characterized by  
6 a quick progression of an acute respiratory failure with severe hypoxemia in older  
7 patients that leads to fatal outcome.  
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15 We found similarities with other series (24) about variables associated to fatality in the  
16 univariate analysis, such as hypertension, cardiovascular disease or pulmonary  
17 diseases. Nevertheless, after adjusting by sociodemographic variables and  
18 comorbidities at admission, risk factors related to death were age, male gender,  
19 neurological disease, chronic kidney disease and cancer. These findings are  
20 consistent with other studies that identify male sex and age as important predictors for  
21 mortality (25). However, this analysis has some limitations because it only focuses in  
22 hospitalized patients skewing estimates of the morbi-mortality and risk factors of  
23 COVID-19 globally (11).  
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37 The strength of this study lies on the sequential collection of patients (all COVID-19  
38 patients admitted to hospital were included) and on the complete follow-up of all  
39 patients during their entire hospital stay. On the other hand, it also has some  
40 limitations. First, its observational and retrospective nature. Second, some variables  
41 (i.e. anosmia and history of thromboembolic event) have a relatively large number of  
42 missing values because they were not registered from the beginning of the study, due  
43 to changes in the evidence related to COVID-19 during the progression of the  
44 pandemic. Third, there is no follow-up after hospital discharge, so only in-hospital  
45 fatality can be estimated.  
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3 We are now attending a second outbreak of COVID-19 in Madrid. Compared to the  
4 first outbreak, the speed of community transmission is lower, the case detection  
5 capacity is higher, there is more knowledge of the disease and the possible treatments  
6 and healthcare settings are better prepared. All these factors will probably have a great  
7 impact on the analysis if the study were to be repeated now. Future analysis comparing  
8 results from first and consecutive waves of COVID-19 pandemic at ILUH would be  
9 interesting to make.  
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## 23 **CONCLUSION**

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26 This study describes the epidemic progression, clinical characteristics, complications  
27 and outcomes of COVID-19 patients attended in a secondary level hospital in one of  
28 the highest COVID-19 incidence neighborhoods of Madrid, which turned into an entire  
29 COVID-19 center and almost doubled its bed capacity, during the first wave of COVID-  
30 19 pandemic in Spain. Fatal outcomes were similar to those reported by hospitals with  
31 a higher level of complexity.  
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## 26 FOOTNOTES

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33 MFV, IFJ, PR, EAA, EIG, AL and EG performed the data collection. MFV and  
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- **Ethics approval:** The Institutional Review Board of Infanta Leonor University Hospital approved this study (Code ILUH R 027-20)) and due to the retrospective nature, they waived the need for informed consent from patients.
- **Reporting guidelines:** The STROBE statement guidelines were followed in the conduct and reporting of the study.
- **Provenance and peer review:** Not commissioned; externally peer reviewed.
- **Data availability statement:** All data relevant to the study are included in the article or uploaded as supplementary information. Extra data is available by emailing [ejgonzalezbuitrago@salud.madrid.org](mailto:ejgonzalezbuitrago@salud.madrid.org).

## REFERENCES

1. Gorbalenya AE, Baker SC, Baric RS, de Groot RJ, Drosten C, Gulyaeva AA, et al. The species Severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. *Nat Microbiol.* 2020;5(4):536–44.
2. World Health Organization (WHO). Coronavirus disease (COVID-19) Situation Report-129. Available at: [https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200528-covid-19-sitrep-129.pdf?sfvrsn=5b154880\\_2](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200528-covid-19-sitrep-129.pdf?sfvrsn=5b154880_2) Accessed 31 May 2020.
3. World Health Organization (WHO). Novel Coronavirus (2019-nCoV) Situation Report 12. Available at: <https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200201-sitrep-12->

- 1  
2  
3 ncov.pdf?sfvrsn=273c5d35\_2. Accessed 02 May 2020.  
4  
5  
6 4. Ministerio de Sanidad. Gobierno de España. Análisis epidemiológico COVID  
7  
8 19 . España. Available at:  
9  
10 [https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nC](https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov-China/situacionActual.htm)  
11  
12 [ov-China/situacionActual.htm](https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov-China/situacionActual.htm) Accessed 02 May 2020.  
13  
14  
15  
16 5. Ministerio de Sanidad. Centro de Coordinación de Alertas y Emergencias  
17  
18 Sanitarias. Actualización nº 197. Enfermedad por el coronavirus (COVID-19).  
19  
20 01.09.2020 Available  
21  
22 at:[https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasAct](https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasActual/nCov/documentos/Actualizacion_197_COVID-19.pdf)  
23  
24 [ual/nCov/documentos/Actualizacion\\_197\\_COVID-19.pdf](https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasActual/nCov/documentos/Actualizacion_197_COVID-19.pdf) Accessed 05  
25  
26  
27 September 2020.  
28  
29  
30 6. Ministerio de Sanidad. Centro de Coordinación de Alertas y Emergencias  
31  
32 Sanitarias. Actualización no 119. Enfermedad por el coronavirus (COVID-19).  
33  
34 28.05.2020. Available at:  
35  
36 [https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasActual/](https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasActual/nCov-China/documentos/Actualizacion_119_COVID-19.pdf)  
37  
38 [nCov-China/documentos/Actualizacion\\_119\\_COVID-19.pdf](https://www.mscbs.gob.es/en/profesionales/saludPublica/ccayes/alertasActual/nCov-China/documentos/Actualizacion_119_COVID-19.pdf) Accessed 6 June  
39  
40  
41 2020.  
42  
43  
44 7. Comunidad de Madrid. Hospital Universitario Infanta Leonor. Memoria 2018  
45  
46 Available at:  
47  
48 [https://www.comunidad.madrid/sites/default/files/doc/sanidad/memo/hosp-](https://www.comunidad.madrid/sites/default/files/doc/sanidad/memo/hosp-memoria-2018-hinfantaleonor_ok.pdf)  
49  
50 [memoria-2018-hinfantaleonor\\_ok.pdf](https://www.comunidad.madrid/sites/default/files/doc/sanidad/memo/hosp-memoria-2018-hinfantaleonor_ok.pdf) Access 07 June 2020.  
51  
52  
53  
54 8. Comunidad de Madrid. Transparencia. Covid-19-TIA por municipios y distritos  
55  
56 de Madrid. Available at:  
57  
58 [https://datos.comunidad.madrid/catalogo/dataset/covid19\\_tia\\_muni\\_y\\_distritos](https://datos.comunidad.madrid/catalogo/dataset/covid19_tia_muni_y_distritos)  
59  
60

- 1  
2  
3 Accessed 01 June 2020.  
4  
5  
6 9. Borobia A, Carcas A, Arnalich F, Álvarez-Sala R, Monserrat-Villatoro J,  
7  
8 Quintana M, et al. A Cohort of Patients with COVID-19 in a Major Teaching  
9  
10 Hospital in Europe. *J Clin Med* [Internet]. 2020 Jun 4 [cited 2020 Jun  
11  
12 6];9(6):1733. Available from: <https://www.mdpi.com/2077-0383/9/6/1733>  
13  
14  
15  
16 10. Casas Rojo JM, Antón Santos JM, Millán Núñez-Cortés J, Lumbreras Bermejo  
17  
18 C, Ramos Rincón JM, Roy-Vallejo E, et al. Clinical characteristics of patients  
19  
20 hospitalized with COVID-19 in Spain: results from the SEMI-COVID-19  
21  
22 Network. *medRxiv* [Internet]. 2020 Jan 1;2020.05.24.20111971. Available  
23  
24 from:  
25  
26 <http://medrxiv.org/content/early/2020/05/26/2020.05.24.20111971.abstract>  
27  
28  
29  
30 11. Prieto-Alhambra D, Ballo E, Coma-Redon E, Mora N, Aragon M, Prats-Urbe  
31  
32 A, et al. Hospitalization and 30-day fatality in 121,263 COVID-19 outpatient  
33  
34 cases. *medRxiv* [Internet]. 2020 Jan 1;2020.05.04.20090050. Available from:  
35  
36 <http://medrxiv.org/content/early/2020/05/08/2020.05.04.20090050.abstract>  
37  
38  
39  
40 12. Heili-Frades S, Minguez P, Mahillo-Fernandez I, Prieto-Rumeau T, Herrero  
41  
42 Gonzalez A, de la Fuente L, et al. COVID-19 Outcomes in 4712 consecutively  
43  
44 confirmed SARS-CoV2 cases in the city of Madrid. *medRxiv* [Internet]. 2020  
45  
46 Jan 1;2020.05.22.20109850. Available from:  
47  
48 <http://medrxiv.org/content/early/2020/05/25/2020.05.22.20109850.abstract>  
49  
50  
51  
52 13. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research  
53  
54 electronic data capture (REDCap)-A metadata-driven methodology and  
55  
56 workflow process for providing translational research informatics support. *J*  
57  
58 *Biomed Inform* [Internet]. 2009;42(2):377–81. Available from:  
59  
60

- 1  
2  
3 <http://dx.doi.org/10.1016/j.jbi.2008.08.010>  
4  
5  
6 14. Garg S, Kim L, Whitaker M, Cummings C, Holstein R, Prill M, et al. MMWR -  
7 Hospitalization Rates and Characteristics of Patients Hospitalized with  
8 Laboratory-Confirmed Coronavirus Disease 2019 — COVID-NET, 14 States,  
9 March 1–30, 2020 [Internet]. 2019. Available from:  
10 <https://www.cdc.gov/coronavirus/2019-ncov/>  
11  
12  
13  
14  
15  
16  
17  
18 15. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors  
19 for mortality of adult inpatients with COVID-19 in Wuhan, China: a  
20 retrospective cohort study. *Lancet* [Internet]. 2020;6736(20):1–9. Available  
21 from: [http://dx.doi.org/10.1016/S0140-6736\(20\)30566-3](http://dx.doi.org/10.1016/S0140-6736(20)30566-3)  
22  
23  
24  
25  
26  
27  
28 16. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson  
29 KW, et al. Presenting Characteristics, Comorbidities, and Outcomes Among  
30 5700 Patients Hospitalized With COVID-19 in the New York City Area. *JAMA*  
31 [Internet]. 2020 Apr 22; Available from:  
32 <https://jamanetwork.com/journals/jama/fullarticle/2765184>  
33  
34  
35  
36  
37  
38  
39  
40 17. Lodigiani C, Iapichino G, Carenzo L, Cecconi M, Ferrazzi P, Sebastian T, et al.  
41 Venous and arterial thromboembolic complications in COVID-19 patients  
42 admitted to an academic hospital in Milan, Italy. *Thromb Res* [Internet]. 2020  
43 Apr 23;191:9–14. Available from: <https://pubmed.ncbi.nlm.nih.gov/32353746>  
44  
45  
46  
47  
48  
49  
50 18. Rubio O, Estella A, Cabre L, Saralegui-Reta I, Martin MC, Zapata L, et al.  
51 Ethical recommendations for a difficult decision-making in intensive care units  
52 due to the exceptional situation of crisis by the COVID-19 pandemic: A rapid  
53 review & consensus of experts. *Med Intensiva* [Internet]. 2020;20(S0210-  
54 5691):30110–8. Available from: <https://doi.org/10.1016/j.medin.2020.04.006>  
55  
56  
57  
58  
59  
60

- 1  
2  
3 19. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical Characteristics of  
4  
5 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia  
6  
7 in Wuhan, China. JAMA [Internet]. 2020 Mar 17 [cited 2020 Jun  
8  
9 6];323(11):1061. Available from:  
10  
11 <https://jamanetwork.com/journals/jama/fullarticle/2761044>  
12  
13
- 14  
15 20. Grasselli G, Zangrillo A, Zanella A, Antonelli M, Cabrini L, Castelli A, et al.  
16  
17 Baseline Characteristics and Outcomes of 1591 Patients Infected With SARS-  
18  
19 CoV-2 Admitted to ICUs of the Lombardy Region, Italy. Jama [Internet].  
20  
21 2020;1–8. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/32250385>  
22  
23
- 24  
25 21. Gold JAW, Wong KK, Szablewski CM, Patel PR, Rossow J, Silva J, et al.  
26  
27 Characteristics and clinical outcomes of adult patients hospitalized with  
28  
29 COVID-19 — Georgia, March 2020. Morb Mortal Wkly Rpt. 2020;69(18):1–6.  
30  
31
- 32  
33 22. Docherty AB, Harrison EM, Green CA, Hardwick HE, Pius R, Norman L, et al.  
34  
35 Features of 16,749 hospitalised UK patients with COVID-19 using the ISARIC  
36  
37 WHO Clinical Characterisation Protocol. medRxiv [Internet]. 2020 Jan  
38  
39 1;2020.04.23.20076042. Available from:  
40  
41 <http://medrxiv.org/content/early/2020/04/28/2020.04.23.20076042.abstract>  
42  
43
- 44  
45 23. Liang WH, Guan WJ, Li CC, Li YM, Liang HR, Zhao Y, et al. Clinical  
46  
47 characteristics and outcomes of hospitalised patients with COVID-19 treated in  
48  
49 Hubei (epicenter) and outside Hubei (non-epicenter): A Nationwide Analysis of  
50  
51 China. Eur Respir J. 2020 Apr 8;  
52
- 53  
54 24. Chen T, Wu D, Chen H, Yan W, Yang D, Chen G, et al. Clinical characteristics  
55  
56 of 113 deceased patients with coronavirus disease 2019: retrospective study.  
57  
58 BMJ [Internet]. 2020;368(December 2019):m1091. Available from:  
59  
60

1  
2  
3 <http://dx.doi.org/doi:10.1136/bmj.m1091>  
4  
5

- 6 25. Williamson E, Walker AJ, Bhaskaran KJ, Bacon S, Bates C, Morton CE, et al.  
7  
8 OpenSAFELY: factors associated with COVID-19-related hospital death in the  
9  
10 linked electronic health records of 17 million adult NHS patients. medRxiv  
11  
12 [Internet]. 2020 Jan 1;2020.05.06.20092999. Available from:  
13  
14 <http://medrxiv.org/content/early/2020/05/07/2020.05.06.20092999.abstract>  
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#### 24 **LIST OF IMAGES:**

25  
26  
27 Figure 1. Epidemic curve of COVID-19 confirmed cases seen at ILUH

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29 Figure 2. Population flow chart  
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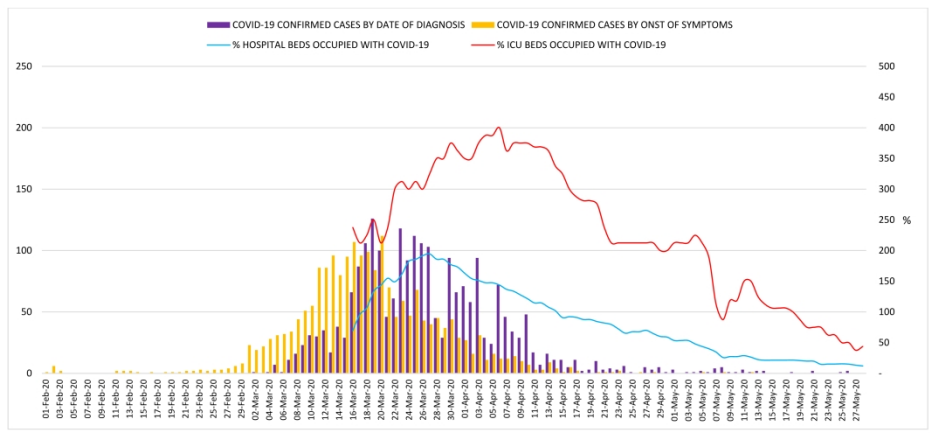
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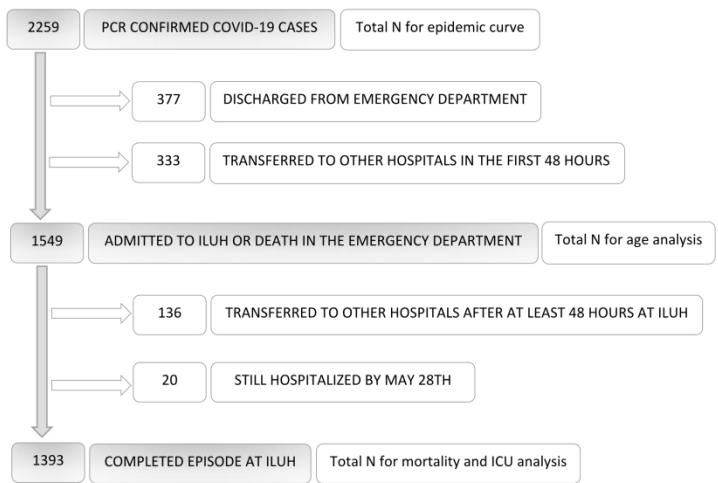
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## Characteristics, Complications and Outcomes Among 2259 Patients Hospitalized with COVID-19 in a Secondary Level Hospital in Madrid, Spain

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	Yes <i>Pag 1-2</i>
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	Yes <i>Pag 1-2</i>
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Yes <i>Pag 3-4</i>
Objectives	3	State specific objectives, including any prespecified hypotheses	Yes <i>Pag 4</i>
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	Yes <i>Pag 5</i>
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Yes <i>Pag 5</i>
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	Yes <i>Pag 5</i>
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Yes <i>Pag 5-6</i>
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Yes <i>Pag 5-6</i>
Bias	9	Describe any efforts to address potential sources of bias	Yes <i>Pag 5-6</i>
Study size	10	Explain how the study size was arrived at	Yes <i>Pag 6</i>
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Yes <i>Pag 6</i>

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Statistical methods

- 12 (a) Describe all statistical methods, including those used to control for confounding
- (b) Describe any methods used to examine subgroups and interactions
- (c) Explain how missing data were addressed
- (d) *Cohort study*—If applicable, explain how loss to follow-up was addressed  
*Case-control study*—If applicable, explain how matching of cases and controls was addressed  
*Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
- (e) Describe any sensitivity analyses

<b>Yes</b> <b>Pag 6</b>
<b>Yes</b> <b>Pag 6</b>

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<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	<i>Yes</i> <i>Pag 7</i>
		(b) Give reasons for non-participation at each stage	<i>Yes</i> <i>Fig 2</i>
		(c) Consider use of a flow diagram	<i>Yes</i> <i>Fig 2</i>
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	<i>Yes</i> <i>Pag 7-10</i> <i>Fig 1</i> <i>Tables 1-3</i>
		(b) Indicate number of participants with missing data for each variable of interest	<i>Yes</i> <i>Tables 1-3</i>
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	<i>Yes</i> <i>Pag 9</i> <i>Fig 1</i>
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	<i>Yes</i> <i>Pag 9</i> <i>Table 3</i>
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	<i>Yes</i> <i>Pag 7-10</i> <i>Tables 1-3</i>
		(b) Report category boundaries when continuous variables were categorized	<i>Yes</i> <i>Pag 7-10</i> <i>Tables 1-3</i>
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	<i>Yes</i> <i>Pag 9</i> <i>Uni/multivariate</i>
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	<i>Yes</i> <i>Pag 10-12</i>
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	<i>Yes</i> <i>Pag 10-12</i>
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	<i>Yes</i> <i>Pag 10-12</i>
Generalisability	21	Discuss the generalisability (external validity) of the study results	<i>Yes</i> <i>Pag 12</i>



**Other information**

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	<i>Yes</i> <i>Pag 14</i>
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\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).