

Clinical characteristics and risk factors of patients with coronavirus disease (COVID-19) in a Tertiary Hospital of Colombia. (Characteristics of patients with COVID-19)

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Abstract

Objective: SARS-CoV-2 infection is spreading around the world, including countries from Latin America. The purpose of the study was to analyse the clinical characteristics of COVID-19 patients admitted to the San Jose de Popayan Hospital in Colombia.

Methods: A retrospective study was conducted with 620 COVID-19 patients. The hospitalized patients were divided into two groups on admission, that is, nonsevere and severe.

Results: The mean age was 53 years and a greater number of male patients developed the severe form (73.3%) and died (67.1%). The leading comorbidities were HTN, cardiovascular disorders, diabetes, Obesity, respiratory disorders, rheumatologic disease, chronic kidney disease, malignancy and malnutrition. Malnutrition represented a greater risk in the population over 65 years of age (OR= 8.563, 95% CI: 2.290–32.029]; p value <0.001). On comparative analysis of both groups (nonsevere and severe), a significant increase in severity was determined in advanced age: 56–65 years (OR= 2.668; p<0.001) and >65 years (OR= 7.448; p<0.001), anosmia at hospital admission (OR= 4.599; p=0.004) and cough (OR= 1.867; p=0.002).

Conclusions: Our study estimated that age over 65 years with malnutrition and signs of cough and anosmia on admission were estimated as higher risk factors to develop severe disease.

Keywords: COVID-19, clinical outcome, clinical signs, severity, infection.

1. Introduction.

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causing the current pandemic that was reported since December 2019 (China Wuhan Municipal Health Commission, 2019), and the disease caused by it was named coronavirus disease 2019 (COVID-19) by World Health Organization (WHO) (WHO, 2020).

The clinical features of the disease include fever, sore throat, cough, shortness of breath (SOB) or dyspnea, myalgia, fatigue, and pneumonia (Yang et al., 2020). In some cases, viral infection can lead to severe pneumonia, thromboembolic phenomena, acute cardiac injury, kidney injury and neurological damage and shock. The severity of the disease is accentuated in patients with underlying diseases including cardiovascular disease (CVD), diabetes, hypertension (HTN) chronic obstructive pulmonary disease (COPD), and malignancy (Liu et al., 2020). Advanced age and biological sex are risk factors that are also related to the degree of severity of the disease (Hussin et al., 2020; Cen et al., 2020). Case fatality rates of COVID-19 increase in patients with risk factors and a late applying intensive care treatment (Wenham et al., 2020; Zhou et al., 2020).

Understanding the clinical characteristics and the risk factors of severe cases is critically important to improve the efficacy and outcome for the COVID-19 treatment. The aim of our study was to analyse the epidemiological and clinical characteristics of patients infected with SARS-CoV-2 after diagnosis through detection of viral nucleic acid by reverse transcription polymerase chain reaction (RT-PCR) test. The results may aid in patient management while helping to develop policies for prevention and response to COVID-19 and its critical outcomes.

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2. Material and methods.

2.1. Study area.

The city of Popayán is located at 2°27' north and 76°37'18" west longitude of the Greenwich meridian in southwestern Colombia. The estimated population is approximately 270,000 inhabitants in its urban area with a territorial extension of 512 km².

2.2. Study design and participants

For this retrospective, single-center study, the clinical and sociodemographic data were obtained from the medical records of 620 patients with a diagnosis of SARS CoV-2 infection at the San Jose de Popayan Hospital between January 01 to April 30, 2021.

Covid-19 symptoms were diagnosed on the basis of the WHO interim guidance (WHO, 2019). All cases were confirmed by quantitative RT-PCR for SARS CoV-2 of nasal swabs.

We divided these cases into two groups, first group "non-severe, including mild and moderate patients, and the "severe" group including severe and critical patients.

Patients with clinical signs of mild type, the clinical symptoms are mild, and pneumonia is not observed on imaging. Moderate type, with clinical signs of pneumonia fever, cough, dyspnea etc, (SpO₂ \pm 90% on room air). Definition for severe patients to any of the following criteria are met: respiratory rate >30 breaths/min, severe respiratory distress, SpO₂ < 90% on room air, and arterial blood oxygen partial pressure/oxygen concentration \leq 300 mmHg (1 mmHg = 0.133 kPa), with the lesion significantly progressing >50% within 24–48 h on pulmonary imaging; and critical cases requiring a mechanical ventilation, presence of shock, and combined organ multi-organ failure or need for extracorporeal membrane oxygenation (ECMO) therapy.

2.3. Definitions

Obesity was defined as a body mass index of >30 kg/m², a BMI > 30 kg / m² was used to define obesity. CVD was diagnosed if serum levels of cardiac biomarkers (e.g., high sensitive cardiac troponin I or brain natriuretic peptide) increased. Malignancy was defined as the presence of an active solid or haematologic malignant neoplasm. Acute respiratory distress syndrome (ARDS) was defined as the acute onset or worsening of respiratory symptoms with severe hypoxaemia and bilateral opacities on chest radiograph not fully explained by cardiac failure or fluid overload. Acute liver injury was diagnosed if serum levels of liver biomarkers (e.g., Alanine aminotransferase, Aspartate aminotransferase, Total bilirubin) increased. Acute kidney injury was defined as serum creatinine >2.0 mg/dl or urine output <0.5 ml/kg per hour despite adequate fluid resuscitation.

Secondary infection was defined when patients had a positive culture of a new pathogen after admission. Sepsis and septic shock were diagnosed according to sepsis-3.0 definition (Singer et al., 2016).

2.4. Ethical issues

This study had the approval of the Committee on Ethics of Research on Human Beings of the San Jose de Popayan Hospital, under the insertion number 0067HUSJ-CI and the approval number Acta No. 10-2020.

2.5. Statistical analysis

A univariate analysis was carried out to determine the behavior of the continuous variables, normality was determined through a Kolmogorov-Smirnov test, those with a $p > 0.05$ are considered normal distribution and are presented with mean and standard deviation (SD). The variables that did not present a normal distribution were presented with median and interquartile ranges (IQR). Categorical variables were presented as absolute numbers and percentages (%). Continuous variables were expressed as mean and interquartile ranges after testing normal distribution.

To assess significant differences in demographic variables, comorbidities, and symptoms on admission in the groups classified as non-severe and severe were compared using the Chi-square test. Variable with a $p < 0.05$ were considered statistically significant.

Logistic regression analysis was carried out to examine the association of age group, current smoker, obesity, malnutrition, 11 key symptoms (such as fever, cough, sore throat, myalgia, arthralgia, fatigue, dyspnea, headache, general discomfort and diarrhea), and 11 comorbidities (such as HTN, diabetes, asthma, hypothyroidism, CVD, COPD, chronic kidney disease (CKD), malignancy, rheumatologic disease, dementia, neurological disorder) with primary endpoints (non-severe and severe). Odds Ratio (OR) and 95% CIs were calculated. All analyses were performed using SPSS 26.0.

3. Results.

A total of 620 patients were cared for in the hospital during the time of the study with a mean age of 53 years (95% confidence interval [CI]: 37–67). Although the highest number of patients diagnosed with COVID-19 were in the range of 18-45 years, the severe group comprised 37% of patients older than 65 years. The female sex represented 59% among analyzed COVID-19 patients. However, 63.5% of the patients who developed severe disease were males. The mean of hospital stay of all patients was 5.00 days (95% CI: 4.0–11.0), among non-severe cases 2.0 days (95% CI: 1.0–4.0), and for severe cases 7.0 days (95% CI: 4.0–14.0).

The most common symptoms were cough, fever and dyspnea in more than 50% of the patients included in the study group. However, respiratory symptoms such as dyspnea (78.7%) and cough (72.3%) were significantly more frequent in the severe group. Other symptoms included fever (69.9%), headache (49.3%), general discomfort (47.6%), and myalgia (30.6%) ($p < 0.001$).

In this study, 84.4% of the patients had comorbidities that include HTN, cardiovascular disorders, diabetes, Obesity, respiratory disorders, rheumatologic disease, chronic kidney disease, malignancy and malnutrition, among the most common. (Table 1). Malnutrition represented a greater risk in the population over 65 years of age (OR = 8.563, 95% CI: 2.290–32.029]; p value < 0.001).

The patients in the severe group presented 74.4% of these comorbidities, while the non-severe group only 9.3% ($P \leq 0.001$). All malnourished patients were in the severe group, and 36 cases (5.8%) were accompanied with more than 3 comorbidities investigated. Interestingly, dementia (6.6%) was a prevalent comorbidity with a statistically significant value in this group ($p < 0.001$).

According to the clinical outcomes, mixed infection (11.6%), mainly due to Gram negative bacteria, sepsis (10.9%), and acute renal failure (6.2%) were significantly more prevalent in the severe group than in the non-severe group ($p < 0.001$).

Among patients with severe disease, 13.5% required mechanical ventilation, and were especially concentrated in patients older than 65 years (17.5%) (data not shown).

Mortality in the study population was 12.3%, deaths were determined mainly in male (73.7%), and in patients older than 65 years (67.1%).

Table 1. Baseline characteristics of patients infected with COVID-19.

Characteristics	Total n = 620	Severe n = 422	Non-severe n = 198	p-value
Sociodemographic characteristics				
Age (median, 25-75)	53 [37-67]	45 [60-71]	37 [28-52]	<0.001
Age range, (years) n (%)				
<18	9 (1.5)	3 (0.7)	6 (3)	<0.001
18 - 45	231 (37.3)	105 (24.9)	126 (63.6)	
46 - 55	102 (16.5)	69 (16.4)	33 (16.7)	
56 - 65	108 (17.4)	89 (21.1)	19 (9.6)	
> 65	170 (27.4)	156 (37)	14 (7.1)	
Sex, n (%)				0.001
Male	254 (41)	268 (63.5)	98 (49.5)	
Female	366 (59)	154 (36.5)	100 (50.5)	
Current smoker	16 (2.6)	13 (3.1)	3 (1.5)	0.252
Signs and symptoms, n (%)				
Cough	358 (57.7)	305 (72.3)	53 (26.8)	<0.001
Fever	342 (55.2)	295 (69.9)	47 (23.7)	<0.001
Sore throat	23 (3.7)	17 (4)	6 (3)	0.540
Dyspnea	361 (58.2)	332 (78.7)	29 (14.6)	<0.001
General discomfort	254 (41)	201 (47.6)	53 (26.8)	<0.001
Diarrhea	22 (3.5)	13 (3.1)	9 (4.5)	0.358
Anosmia	21 (3.4)	9 (2.1)	12 (6.1)	0.012
Fatigue	50 (8.1)	40 (9.5)	10 (5.1)	0.059
Headache	221 (35.6)	208 (49.3)	13 (6.6)	<0.001
Myalgia	143 (23.1)	129 (30.6)	14 (7.1)	<0.001
Arthralgia	18 (2.9)	13 (3.1)	5 (2.5)	0.701
Comorbidities, n (%)				

Hypertension	154 (24.8)	132 (31.3)	22 (11.1)	< 0.001
Diabetes	93 (15)	84 (19.9)	9 (4.5)	< 0.001
Obesity	105 (16.9)	93 (22)	12 (6.1)	< 0.001
Cardiovascular disease	58 (9.4)	56 (13.3)	2 (1)	< 0.001
Malnutrition	12 (1.9)	12 (2.8)	0	0.017
Rheumatologic disease	49 (7.9)	44 (10.4)	5 (2.5)	0.001
Chronic obstructive pulmonary disease	36 (5.8)	35 (8.3)	1 (0.5)	< 0.001
Asthma	7 (1.1)	7 (1.7)	0	0.103
chronic kidney disease	33 (5.3)	31 (7.3)	2 (1)	0.001
Hypothyroidism	22 (3.5)	18 (4.3)	4(2)	0.159
Malignancy	24 (3.9)	20 (4.7)	4(2)	0.102
Dementia	32 (5.2)	28 (6.6)	4(2)	0.015
Neurological disorder	14 (2.3)	9 (2.1)	5 (2.5)	0.776
Clinical outcome, n (%)				
ARDS	14 (2.3)	14 (3.3)	0	0.010
Mixed infection	52 (8.4)	49 (11.6)	3 (1.5)	< 0.001
Sepsis	48 (7.7)	46 (10.9)	2 (1)	< 0.001
Heart failure	39 (6.3)	38 (9)	1 (0.5)	< 0.001
Hematic failure	24 (3.9)	23 (5.5)	1 (0.5)	0.003
Neurological failure	8 (1.3)	8 (1.9)	0	0.060
Acute renal failure	26 (4.2)	26 (6.2)	0	< 0.001
Multi-organ dysfunction	23 (3.7)	22 (5.2)	1 (0.5)	0.004
Mechanic ventilation	84 (13.5)	84 (19.9)	0	< 0.001
Hospital stay [median, 25-75]	5.0 [2.0-11.0]	7.0 [4.0-14.0]	2.0 [1.0-4.0]	< 0.001
No survivors	76 (12.3%)	75 (12.1)	1 (0.5)	< 0.001

Data are presented as number of patients (%); mean \pm standard deviation or median [25%-75%]. Significant difference, p-value <0.05.

Our logistic regression analysis (described in Table 2) suggests that signs and symptoms variables explain 51%, comorbidity 28% and clinical outcome 45% of the model, (using a Nagelkerke R squared).

Analysis variables associated with severity of the disease were: presence of anosmia at hospital admission (OR= 4.599; p=0.004) and cough (OR= 1.867; p=0.002). A significant increase in severity was determined in advanced age: 56 – 65 years (OR= 2.668; p value <0.001) and >65 years (OR= 7.448; p < 0.001)in severe group than in nonsevere group.

Table 2. Logistic regression analysis of risk factors for severity of patients with COVID-19

Characteristics	OR [IC]	p-value
Sociodemographic characteristics		
Age range,(ref. <56)		
56 – 65 years	2.668 [1.543-4.646]	<0.001
> 65 years	7.448 [4.176-13.281]	<0.001
Signs and symptoms		
Cough	1.867 [1.070-3.593]	0.002
Dyspnea	0.084 [0.473-0.161]	<0.001
Anosmia	4.599 [1.629-12.98]	0.004
Headache	0.298 [0.148-0.600]	0.001
Comorbidities		
Chronic obstructive pulmonary disease	0.062 [0.008-0.469]	0.007
Diabetes	0.308 [0.143-0.663]	0.003
Enfermedad Inmunológica	0.220 [0.083-0.586]	0.002
Obesity	0.200 [0.105-0.382]	<0.001

chronic kidney disease	0.183 [0.041-0.821]	0.027
Hypertension	0.580 [0.334-1.009]	0.054
Cardiovascular disease	0.106 [0.025-0.454]	0.003
Dementia	0.256 [0.084-0.774]	0.016
Clinical outcome		
Mixed infection	0.162 [0.045-0.586]	0.006
Sepsis	0.220 [0.045-1.063]	0.60
Acute respiratory infection	0.280 [0.180-0.436]	<0.001
Pneumonia	0.025 [0.012-0.053]	<0.001
Heart failure	0.062 [0.008-0.506]	0.009
Hematic failure	0.084 [0.010-0.725]	<0.001

Significant difference, p-value <0.05.

4. Discussion.

Our cohort describes the presenting characteristics and outcomes of 620 COVID-19 patients admitted to the main hospital in the southern region of Colombia

The average age of the population studied was 53 years, which is a value higher than the series reported in Spain by Khan et al.(2020), and in China by Bi et al.(2020), and moderately higher than the South Korean series by Park et al.(2020), and lower than the Italian series by Treccarichi et al.(2020).

While that the young population between 18 and 45 years are the most affected by the infection, elderly patients over 65 have the highest rate of severity of the disease and mortality. It is well known that comorbidities often increase with aging, so the elderly population can, in turn, trigger a more serious COVID-19. According to current epidemiological data, pathophysiological changes of the respiratory system are accentuated in elderly patients with a higher risk of death compared to younger patients (Yang et al., 2020; Hussinet al., 2020; Zhou et al., 2020).

According to the theory of immunological senescence, innate immunity diminishes with age (Fulop et al., 2014). The main protective barriers, such as cilia and mucus, are diminished, dysfunctional or atrophied in the elderly, these factors are essential to prevent the virus from entering the cell. On the other hand, macrophages and epithelial cells also presents aging changes, these cells are responsible for the presentation of the antigen and the recruitment of lymphocytes, constituting lymphopenia (<800 L/c), and thus increasing the risk of mortality by up to 80% in older patients (Fulop et al., 2014). In this sense, Zhou et al. (2020) found that old age and lymphopenia are potential risk factors for severe COVID-19. We found that malnutrition represented more than eight times the possibility of being present in patients older than 65 years, which may be an important factor that contributes to the deterioration of the immune system in these patients.

Although a greater number of women were reported with COVID-19, 63.5% of men developed severe disease and 73.7 % of them died in concordance to the literature that indicates to aged men and with underlying disease are associated with the most severe and fatal cases (Wenham et al., 2020; Gebhard et al., 2020; Jin et al., 2020). Although the cause of this phenomenon is still unknown, some researchers suggest that biological sex is probably conditioning the differential response of the immune system. In some viral infections, it has been established that women appear to be less susceptible to them due to the intense and prolonged innate, humoral, and cell-mediated immune responses (Han et al., 2001; Noymer, 2010)

The results of our study indicate that in addition to advanced age, COVID-19 patients who present with cough and anosmia at hospital admission are associated with greater severity of the disease. These results are perhaps due to a higher viral infectivity of the upper and lower respiratory tract epithelium simultaneously or to the admission of a higher viral load due to continuous exposures.

5. Conclusions.

Our study estimated that older men with underlying diseases such as hypertension, diabetes, obesity, cardiovascular, rheumatic, malignant and chronic kidney diseases with signs of cough, dyspnea, fever, headache, arthralgia, and anosmia were seen significantly in severe group.

Malnutrition was the comorbidity that presented the highest risk in patients older than 65 years. these patients with cough and anosmia on admission are at increased risk of presenting a severe clinical form.

Conflicts of Interest

The authors declared that they have no conflicts of interest.

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