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FACTORS ASSOCIATED WITH PROGRESSION TO CRITICAL ILLNESS IN COVID-19 PATIENTS

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Abstract:
Introduction: *The world has witnessed a rapid escalation of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and it has become a global pandemic since March 2020.* ***Objectives****: The main objective of the study is to analyse the factors associated with progression to critical illness in COVID-19 patients.* ***Material and methods:*** *This cross sectional study was conducted in Islamic International Medical College during January 2020 to June 2020. The data was collected from confirmed COVID-19 patients. Subjects who met eligibility criteria were referred by their treating physicians.* ***Results:*** *The data was collected from 200 confirmed COVID-19 patients. The most common self-reported symptoms at onset of illness were fever, cough, fatigue, sputum production, anorexia, and dyspnea. A total of 116 patients had typical abnormal findings on chest CT, with a median lung CT score of 6. Sixty-nine patients were identified as having severe or critical pneumonia.* ***Conclusion:*** *It is concluded that COVID-19 is a fast-evolving, global pandemic with a higher risk of severe or critical illnesses in individuals who are older, have underlying hypertension.*

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INTRODUCTION:

The world has witnessed a rapid escalation of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and it has become a global pandemic since March 2020 [1]. Many patients who are asymptomatic or experience only mild symptoms have a favorable clinical course and recover soon. However, once it progresses to severe COVID-19 or even a critical stage, patients require more intensive medical resource utilization and have a worse prognosis, with a case fatality rate about 20 times higher than that for non-severe patients [2]. To date, there is no specific anti-coronavirus therapy for severe or critical COVID-19, and whether remdesivir is associated with significant clinical benefits for severe COVID-19 still requires further confirmation [3].

A recent report indicated that early triple antiviral therapy may be helpful in alleviating symptoms and shortening the duration of viral shedding in patients with mild-to-moderate COVID-19 [4]. Thus, the key step in reducing the mortality from COVID-19 should be the prevention of progression from non-severe to severe disease stage and the subsequent development of critical illness. Given the fact that the number of confirmed cases is rapidly growing, and effective medical resource is becoming increasingly scarce, there is an urgent need to identify potential high-risk patients to guide reasonable treatment allocation [5].

Coronavirus disease 2019 (COVID-19) is a viral respiratory syndrome caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). This novel virus was discovered in Wuhan City, Hubei Province, China, in December 2019. As of September 6, 2020, confirmed cases have risen to more than 27,000,000 worldwide and more than 885,000 people have died [1]. Currently, no cure or standard treatment for COVID-19 exists.

The majority of people with COVID-19 experience an asymptomatic, mild, or manageable course of disease [6]. The most common symptoms include fever, cough, fatigue, dyspnea, headache, diarrhea, myalgia, and/or loss of taste and smell. However, 19% of those who are infected with the virus become severely or critically ill. Life-threatening illness occurs when the virus triggers a progressive hyper-immune response or "cytokine storm" progressing to acute respiratory distress syndrome (ARDS), cardiac injury, thrombotic complications, septic shock, and/or organ failure [7].

Objectives

The main objective of the study is to analyse the factors associated with progression to critical illness in COVID-19 patients.

MATERIAL AND METHODS:

This cross sectional study was conducted in Islamic International Medical College during January 2020 to June 2020. The data was collected from confirmed COVID-19 patients. Subjects who met eligibility criteria were referred by their treating physicians. Patients were enrolled regardless of previous treatment or therapies for COVID-19, including experimental medications and therapies administered off-label. Recipients were monitored and all adverse reactions or events were recorded whether or not they were related to the plasma infusion. Demographic, clinical, and outcomes data were prospectively collected from electronic patient medical records at each of the four hospitals. Descriptive data included sex, age, race, ethnicity, smoking status, functional status, comorbidities, living situation, and means of arrival to the hospital.

The data were collected and analysed using SPSS 19. All the values were expressed in mean and standard deviation.

RESULTS:

The data was collected from 200 confirmed COVID-19 patients. The most common self-reported symptoms at onset of illness were fever, cough, fatigue, sputum production, anorexia, and dyspnea. A total of 116 patients had typical abnormal findings on chest CT, with a median lung CT score of 6. Sixty-nine patients were identified as having severe or critical pneumonia. Patients who were obese showed a trend towards to develop severe or critical pneumonia though without statistically significance. The clinical symptoms at illness onset also differed, with those suffering from severe or critical disease more likely to present with fever and dyspnea.

Table 1: Clinical risk factors associated with development of severe or critical illnesses.

Variables	*P* value	Multivariate OR (95% CI)	*P* value
Age	< 0.001	1.04 (1.02-1.07)	< 0.001
Male gender	0.275		
Smoking history	0.132		
Hypertension	< 0.001		0.07
Diabetes	0.002		0.16
Cardiovascular disease	0.035		0.807
COPD	< 0.001	6.53 (2.44-23.26)	< 0.001
Obesity	0.062		0.060
Age	< 0.001	1.04 (1.02-1.06)	< 0.001
Male gender	0.28		
Smoking history	0.14		
Hypertension	< 0.001		0.05

DISCUSSION:

Among this group of hospitalized patients with severe or critical COVID-19 who received convalescent plasma with adequate total anti-SARS-CoV-2 antibody titer (1:320), only one patient experienced a transient transfusion reaction. This low rate of adverse event secondary to convalescent plasma therapy is consistent with recent published literature. It is important to understand the timeline and dynamics of COVID-19 hospitalizations in Connecticut and Western Massachusetts at the time when we launched our research study [7]. Our study patients presented initially to the hospital with an average of 7.3 days (95% CI 6.4–8.2) from symptoms' onset to hospitalization, and 97% (37/38) of the patients had moderate to severe disease without evidence of ARDS or urgent need for invasive ventilation support upon admission [8].

By the time we enrolled our first patient in late April 2020, hospitals participating in the study were at their peak COVID-19 census, with a large number of seriously ill patients who had been hospitalized for an average of 2 weeks, and were not improving with supportive care or medications [9]. Some of those patients deteriorated and needed ICU care and ventilator support for an average of 7 days prior to enrollment. Many had severe lung damage and multi-organ failure. In the early phase of our study, physicians enrolled mostly patients in this critical illness category. In the majority of cases, patients died as a result of secondary irreversible complications of COVID-19 [10].

CONCLUSION:

It is concluded that COVID-19 is a fast-evolving, global pandemic with a higher risk of severe or critical illnesses in individuals who are older, have underlying hypertension. For patients with severe or critical COVID-19 disease, convalescent plasma from recovered patients with COVID-19 is safe and has the potential for positive impact on clinical outcomes including recovery and survival if given early in the course of the disease, and in adequate amount.

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