

Pathogenesis of COVID-19 associated with organ-based comorbidities

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A B S T R A C T

The coronavirus disease of 2019 outbreak remains progressing promptly, worldwide. It is associated with many comorbidities which in turn is related to patient survival. The goal of this review is to identify prevalence of comorbidities associated to CoVID-19. Comorbidities associated with CoVID-19 are mostly hypertension, cerebro-vascular disease, cardiovascular diseases, diabetes, hepatitis C & B, kidney diseases, immunodeficiency, cancer, coronary artery disease, congestive heart failure, asthma, COPD, obstructive sleep apnea, immunosuppression HIV, malignancy history of solid organ transplant, liver disease, obesity. The method used was search through Google Scholar and PubMed using the key terms 'CoVID-19', 'co-morbidities' up to October 31, 2020.

Keywords: COVID-19; organ comorbidities

Introduction

Coronaviruses cause illness extending from the general cold to more serious diseases. Coronavirus disease of 2019 (CoVID-19) is caused by a coronavirus well-known as Severe Acute Respiratory Syndrome Coronavirus 2.¹ CoVID-19 is a major concern for health, and it can be devastating, especially for the elder people. There are seven strains of human coronavirus. Coronaviruses are single stranded RNA viruses, and they are susceptible to mutation and recombination. The life cycle of the virus consists of attachment, penetration, biosynthesis, maturation, and release. The virus perhaps affects the cell by attaching its virion protein to the ACE-2 receptor, which is normally present on epithelium alveolar cells of the lung.² The incubation time for CoVID-19 is between 14 to 2 days.³ There are many identification tests for CoVID-19 but generally used is Reverse transcription polymerase chain reaction (RT-PCR).

CoVID-19 transmits from human-to-human through respiratory droplets and interaction with contaminated secretions from an infected person coughs, sneezes, or

exhales.⁴ some preventive measures include; hand hygiene, medical mask and social distancing [5]. There is no specific antiviral treatment, and no vaccine is currently available for treatment of CoVID-19. The treatment is symptomatic. It includes breathing support, steroids, and blood plasma transfusions, plenty of rest.

CoVID-19 with Comorbidities:

Medical symptoms of CoVID-19 are, heterogeneous, as in correspondence to the most recent studies.^{6,15} A study conducted in December 2019 to January 2020 in China showed that the highest occurrence of comorbidities were cardio-vascular illnesses (53.7%) and high blood pressure (16.9%). Patients with minimum one comorbidity were 399 (25.1%) and were older with a mean age of 60.8 vs. 44.8 years whereas patients with two or more comorbidities were older with mean age of 66.2 vs. 58.2 years. Out of total 1590 patients 16.9% reported of hypertension, 3.7% of cardiovascular diseases, 1.9% cerebrovascular disease, 8.2% diabetes, 1.8% hepatitis B, 1.5% COPD, 1.3% chronic kidney

diseases, 1.1% malignancy, 0.2% immunodeficiency. It showed that mostly reports were of hypertension and diabetes. When a comparison with severe cases to non-severe cases were performed, comorbidities were more likely to be hypertension 32.7% vs 12.6%, cardiovascular diseases 33.9% vs 15.3%, cerebrovascular diseases 50.0% vs 15.3%, diabetes 34.6% vs 14.3%, hepatitis B infections 32.1% vs 15.7%, COPD 62.5% vs 15.3%, chronic kidney diseases 38.1% vs 15.7% and malignancy 50.0% vs 15.6%. So, it explained that severe cases have more chances of the prevalence of these comorbidities.¹⁶

In March 2020 seven studies were performed to evaluate the occurrence of comorbidities in SARS-CoV 2, comprising of 1576 diseased patients and results exposed that maximum predominant co-morbidities were hypertension (21.1%), diabetes (9.7%), cardio-vascular (8.4%) and respiratory diseases (1.5%).¹⁷ Another study was conducted in a hospital of Zhongnan (Wuhan, China) from 11 January 2020 to 16 March 2020 to review the involvement of vital organ-centered comorbidities in the prediction of the likely course of CoVID-19 patients. A total of 212 CoVID-19 patients were involved in this retrospective cohort research. CoVID-19 diseased patients with liver, heart and kidney comorbidity were linked to patients without these comorbidities, were more expected to have liver injuries, cardiac injuries, kidney injury, and there percentage was [13.0% (3/23) vs 3.2% (6/189)], [9.1% (3/33) vs 2.2% (4/179)] and [54.5%(6/11) vs 2.0% (4/201)] respectively with higher risk of mortality.¹⁸

In another research of CoVID-19 in New-York on April 2020 included 5700 patients with median age of 63 years with an interquartile range of 52-75 and a range of 0-107 years. It showed that normally occurring comorbidities were high blood pressure (3026; 56.6%), obesity (increase weight) (1737; 41.7%), and diabetes (1808; 33.8%). Other comorbidities existed as cancer 320 (6%), hypertension 3026 (56.6%), coronary artery disease 595 (11.1%), congestive heart failure 371 (6.9%), asthma 479 (9%), chronic obstructive pulmonary disease 287 (5.4%), obstructive sleep apnea 154 (2.9%), immunosuppression HIV 43 (0.8%), history of solid organ transplant 55 (1%), Kidney disease chronic 268 (5%), end-stage 186 (3.5%), liver disease Cirrhosis 19 (0.4%), chronic hepatitis B 8 (0.1%), hepatitis C 3 (0.1%), metabolic disease as obesity

(BMI \geq 30) 1737 (41.7%), morbid obesity (BMI \geq 35) 791 (19.0%) and diabetes 1808 (33.8%).¹⁹

And another study showed evidence of diabetes association with poorer outcomes in CoVID-19 with increased incidence and severity as well. Blood-glucose management is essential for patients who are afflicted with CoVID-19.²⁰

In another study of Wuhan University from 1 January to 10 February 2020 uncovered that frequent symptoms of elder patients with CoVID-19 included fever (94.5%), chest distress (63.6%) and dry cough (69.1%). When matched with young patients, older patients had more laboratory irregularities and comorbidities.²¹ A research showed that older age (SMD: 1.25 [0.78-1.72]), pre-existing comorbidity (RR = 1.69 [1.48-1.94]) and being male (RR = 1.32 [1.13-1.54]) were identified as risk factors of in-hospital mortality.²²

Recent progress:

Currently, there are no anti-viral treatments for CoVID-19, however, Remdesivir, Lopinavir, Ritonavir, Interferon- α Nebulization, Ribavirin, Chloroquine, and Umifenovir may be effective against CoVID-19.^{23,24} A research suggests protective effects of aspirin against CoVID-19 because it hinders the replication of the virus by interfering with viral protein increase and viral RNA synthesis and weaken formation of viral replication transcription complexes in vitro.²⁵ Statins may also offer protection against the growth of CoVID-19.¹⁹

Recommendations:

Diseases such as high blood pressure, diabetes, respiratory disease, cardio-vascular disease, and their vulnerability may be related to the possible consequences of CoVID-19. A larger figure of comorbidities correlates with more disease seriousness. The people with these comorbidities should be included in future CoVID-19 vaccination proposals. More studies should be performed to verify the association. There is a lot of diversity in initial symptoms still many patients have fever and respiratory issues so people with flu like symptoms should be screened properly. Since CoVID-19 is an evolving virus, no specific treatment is currently available. So, we can control this epidemic by following some rules and regulations by WHO. The health policymakers should

implement comprehensive protective measures since medical staff is at risk. It is recommended that a fiber optic bronchoscope and conservative fluid treatment strategy be used for sputum suction and for fluid resuscitation respectively, if needed. To reduce the load of these comorbidity infections affecting deaths in CoVID-19 patients there is a requirement for a worldwide public health campaign to raise awareness.

Conclusion

Patients with any comorbidity and increase in the figure of comorbidities, is associated with worse clinical consequences. Common comorbidities include hypertension, cerebro-vascular disease, cardio-vascular diseases, diabetes, hepatitis C & B, kidney diseases, coronary artery disease, immunodeficiency, cancer, COPD, congestive heart failure, asthma, obstructive sleep apnea, immunosuppression HIV, malignancy history of solid organ transplant, liver disease cirrhosis, obesity. Age is also a risk factor for CoVID-19.

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