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Predictive Factors and Polymorphisms of the ACE-2 Gene in the Susceptibility to Extended COVID-19 Syndrome

Kerorts Nerooler*

Department of Clinical Pulmonology, University of Groningen, 9713 GZ Groningen, Netherlands

Abstract

The COVID-19 pandemic has presented a unique challenge to global public health, with a significant proportion of individuals experiencing prolonged symptoms even after the acute phase of the illness. This extended COVID-19 syndrome, often referred to as "long COVID," encompasses a range of persistent symptoms affecting multiple organ systems. Understanding the factors contributing to susceptibility to this condition is crucial for effective management and treatment. This article explores the role of predictive factors and polymorphisms of the ACE-2 gene in determining susceptibility to extended COVID-19 syndrome. The COVID-19 pandemic has highlighted the wide spectrum of disease severity and the emergence of extended COVID-19 syndrome, characterized by persistent symptoms beyond the acute phase of infection. Understanding the host factors influencing susceptibility to prolonged illness is crucial for patient management and risk stratification. This review synthesizes current literature on predictive factors and polymorphisms of the angiotensin-converting enzyme 2 genes in the susceptibility to extended COVID-19 syndrome. Relevant articles published up to January 2024 were included, focusing on studies investigating genetic variants of ACE-2, their association with disease outcomes and predictive factors for prolonged illness.

Keywords: COVID-19 syndrome • Polymorphisms • ACE-2 gene

Introduction

Extended COVID-19 syndrome, or long COVID, has emerged as a complex and debilitating condition affecting individuals even after recovery from the acute phase of COVID-19. While the exact mechanisms underlying long COVID are still being elucidated, there is growing evidence to suggest that genetic factors may play a significant role in predisposing individuals to this condition. One such candidate gene is ACE-2, which encodes the angiotensin-converting enzyme 2, the primary receptor for the SARS-CoV-2 virus. This article aims to review the current literature on predictive factors and polymorphism of the ACE-2 gene in the susceptibility to extended COVID-19 syndrome. ACE-2 is a key component of the renin-angiotensin-aldosterone system and serves as the receptor for the SARS-CoV-2 virus, facilitating viral entry into host cells [1-3].

Literature Review

The binding of the virus to ACE-2 receptors triggers a cascade of events leading to viral replication and the development of COVID-19 symptoms. Variability in the expression and function of ACE-2 may influence susceptibility to SARS-CoV-2 infection and the severity of COVID-19 disease. Several factors have been implicated in the development of extended COVID-19 syndrome, including age, sex, comorbidities and immune response. Studies have shown that older age, female sex and the presence of certain comorbidities such as obesity, diabetes and autoimmune conditions are associated with an increased risk of developing long COVID. Additionally, dysregulated immune responses, including prolonged inflammation and impaired viral clearance, may contribute to the persistence of symptoms in some individuals. Genetic variations within the ACE-2 gene have been proposed as potential determinants of susceptibility to SARS-CoV-2 infection and COVID-19 severity [4].

Discussion

Single nucleotide polymorphisms in the ACE-2 gene may alter the expression, structure, or function of the ACE-2 receptor, thereby modulating its interaction with the virus. ACE-2 serves as the cellular receptor for SARS-CoV-2, mediating viral entry into host cells. Genetic variations in the ACE-2 gene may influence individual susceptibility to COVID-19 and the development of extended COVID-19 syndrome. Several polymorphisms in the ACE-2 gene have been implicated in modulating viral infectivity, host immune response and disease severity. Additionally, predictive factors such as age, sex, comorbidities and immune status contribute to the risk of prolonged illness in COVID-19 patients. Several studies have identified ACE-2 polymorphisms associated with susceptibility to COVID-19 and its clinical outcomes, including disease severity and mortality [5]. For example, the ACE-2 gene is located on the X chromosome and certain genetic variants may exhibit sex-specific effects on COVID-19 susceptibility. Additionally, polymorphisms affecting ACE-2 expression levels or receptor affinity for the virus have been implicated in the variability of COVID-19 outcomes among different populations. However, further research is needed to validate these findings and elucidate the underlying mechanisms by which ACE-2 polymorphisms influence COVID-19 susceptibility and outcomes [6].

Conclusion

Extended COVID-19 syndrome poses significant challenges for healthcare systems worldwide, with a growing number of individuals experiencing persistent symptoms long after the acute phase of the illness. While the etiology of long COVID remains incompletely understood, genetic factors such as polymorphisms of the ACE-2 gene may contribute to individual differences in susceptibility to this condition. Understanding the role of ACE-2 polymorphisms and other predictive factors in determining susceptibility to extended COVID-19 syndrome is essential for identifying at-risk individuals,

***Address for Correspondence:** Kerorts Nerooler, Department of Clinical Pulmonology, University of Groningen, 9713 GZ Groningen, Netherlands; E-mail: neroolerk@gmail.com*

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developing targeted interventions and improving long-term outcomes for patients affected by this condition. Further research is needed to elucidate the complex interactions between genetic, environmental and immunological factors in the pathogenesis of long COVID and to inform strategies for prevention and treatment.

Acknowledgement

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Conflict of Interest

None.

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