

# Covid-19 in the Setting of Various Congenital Disorders

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## ABSTRACT

Since its first identification in Wuhan, China, in December 2019, the COVID-19 infection has claimed millions of lives, and the millions of others who survived have demonstrated post-COVID complications. The illness substantially impacted people's lives since being declared a pandemic, forcing most people to work from home while others lost their jobs entirely. Folks worldwide were also forced to maintain social distance and stay indoors for most of 2020, leading to increased mental health issues due to the disconnect from friends, family, colleagues, and the outside world. Specifically, persons with congenital disorders were more affected due to their pre-existing conditions. Reported studies reveal that congenital disorders and genetic diseases present higher susceptibility to developing severe COVID-19 because these illnesses already comprise some comorbidities linked to the function and structure of the cardiovascular and respiratory systems. This paper discusses the association between COVID-19 and the three most common congenital disorders: congenital heart disease, cystic fibrosis, and down syndrome.

**KEYWORDS:** COVID-19; Congenital disorders; congenital heart disease; Cystic fibrosis; Down syndrome

## INTRODUCTION

COVID-19 is an acute airway disease resulting from severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. The initial occurrences were identified in Wuhan, China, at the end of 2019 [2], and the infection was declared a pandemic by the World Health Organization in March 2020 following the public health threat [3]. Its spreading speed confirmed how COVID-19 is contagious because although it is not the first pandemic in human history, it is undoubtedly the first to cover the entire globe. The previous pandemics demonstrated healthcare professionals' inadequate readiness for a pandemic [4] and the necessity to avail informed knowledge [5]. Hence, most global public health societies have provided updated directives. Multiple approaches have also been integrated to regulate transmission, encompassing credible tracking of SARS-CoV-2 severity and transmission rates, moderation of effects of COVID-19 in social care settings and healthcare, identification of clusters in specific environments, and maintenance of COVID-19's eradication status [6]. COVID-19 has been proven to significantly affect persons with various congenital

disorders worldwide. This mini-review evaluates how COVID-19 relates to congenital heart disease, cystic fibrosis, and down syndrome.

## REVIEW

### COVID-19 and Congenital-Heart-Disease (CHD)

Heart disease was flagged among mortality risk factors in the initial phases of the COVID-19 pandemic [7]. Adults with CHD, which impacts more than 2.5 million folks in Europe [8] and 1.5 million individuals in the United States [9], are identified as a high-morbidity population, vulnerable to various cardiovascular dysfunction and deterioration. Research from a pathophysiological perspective shows that COVID-19 infection in children with CHD leads to poorer outcomes due to poorer outcomes of respiratory illnesses in kids with CHD, the destructive impact of COVID-19 on the heart, and the fact that most of these children may have concomitant anomalies in other organs like the kidneys and lungs. Alsaled et al. [10] state that children with severe CHD have

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refractory end-organ dysfunction and hypoxemia, making them more susceptible to COVID-19 effects [11]. As a result, the patient's clinical representations are vital, particularly among kids with CHD, because worsening the cardiac conditions, including fever, palpitations, and shortness of breath, mimic that of COVID-19 and, if unaddressed, may lead to fatal outcomes like death. Researchers have hypothesized multiple theories on how SARS-CoV-2 harms cardiomyocytes since the exact mechanism remains unknown. Tan suggests that it could occur from a COVID-19-generated cytokine storm or the increased oxygen demand of cardiomyocytes that cause hypoxia during acute respiratory distress syndrome (ARDS), leading to oxidative stress [12]. Much as there is still insufficient evidence to display the effects of COVID-19 on CHD patients, current studies portray they may be at an increased risk of intensive care unit admission and cardiovascular problems such as stroke at 22%, arrhythmias at 22%, and heart failure at 55% [13].

### COVID-19 and Cystic Fibrosis (CF)

Cystic fibrosis ranked among the leading genetic diseases correlated with COVID-19. CF is North America's most prevalent fatal congenital disease and has a classic Mendelian autosomal recessive trait [14]. The recent COVID-19 epidemic has significantly affected patients with comorbidities. Like COVID-19, which instigates sepsis, cytokine storm, and life-threatening acute respiratory illnesses, persons with CF also exemplify hyper-inflammation and cytokine dysfunction that overlaps with COVID-19's pathophysiology [15].

Even though people with CF are susceptible to acute exacerbations of chronic lung disease, often resulting from respiratory tract viral infections, SARS-CoV-2 infection rates are comparatively reduced among patients with CF. Case in point, the mortality, morbidity, and increased pulmonary exacerbations associated with respiratory syncytial virus (RSV) infection, popular among respiratory viruses, are lower than expected among children with CF [16]. This may be attributable to research that RSV may require a whole autophagic pathway for replication, associated with evidence that autophagy is dysregulated in CF cells. Also, the non-elevated anxiety scores among children with CF during the pandemic may result from the fact that these kids encounter consistent disease anxiety and may have developed more adaptive measures to cope with future crises [17]. Nonetheless, evidence suggests that specific CF population subsets like those who have had a transplant may especially face severe clinical courses. Further, research from an Italian sample indicated an increased risk of stress and mental health issues associated with COVID-19 among individuals with CF [18]. Thus, more data is required to characterize the effect of COVID-19 on CF patients.

### COVID-19 And Down Syndrome (DS)

Down Syndrome (DS) is America's leading genetic condition, affecting hundreds of thousands of individuals today. Research by Malle et al. stated that persons with DS were more likely to be affected by COVID-19-associated complications, including sepsis and acute respiratory disease syndrome (ARDS), since ten out of 12 patients progressed to sepsis [19]. Patients with DS experience a state of uncontrolled inflammation and are predisposed to a higher risk of death. Further, Espinosa states that regardless of the limited data on the effects of COVID-19 on patients with DS, their research proves that persons with trisomy 21 should be considered more susceptible to developing more severe symptoms and augmented rates of secondary bacterial infections, hospitalization, intensive care and mortality from SARS-CoV-2 compared to the general

population [20]. Also, after adjusting for care home residence and pulmonary and cardiovascular diseases, Clift et al. estimated a four-fold amplified risk for COVID-19-associated hospitalization and a ten-fold increased susceptibility for COVID-19 death in individuals with DS [21]. Still, this group has been scarcely protected during the pandemic due to the unawareness of DS on COVID-19 outcomes. Thus, specific conditions that may confer increased susceptibility should be employed by public health organizations, healthcare workers, and policymakers to safeguard these vulnerable individuals.

### CONCLUSION

The COVID-19 pandemic has considerably impacted hospitals and healthcare facilities and disrupted people's everyday life. The research provided from various studies highlights the correlation between COVID-19 and multiple genetic diseases and congenital disorders. This paper only focuses on CHD, CF, and DS, but a further comprehensive review is needed to describe the association with other congenital anomalies that may pose long-term impacts among the affected patients.

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