



The Intriguing Course of Coronavirus and its Age Dependent Variation in the Disease Outcome - A Concise Update

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ABSTRACT

Coronavirus is part of a family of enveloped positive-strand RNA viruses that infect mammals. COVID-19 pandemic which is caused by severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2] has affected hundreds of thousands of people worldwide with a rapid spreading and mutating strain of the virus. Morbidity and mortality of COVID-19 infections vary extensively from asymptomatic, mild to deadly and critical. Strangely, children were found to be protected from severe or deadly critical infections due to various reasons, on the other hand elderly with co-morbidities and immunocompromised adults were the most affected by this virus. Children with COVID-19 infection also present with similar symptoms as adults such as fever, dry cough, runny nose and nasal congestion, nausea, vomiting, diarrhoea, anosmia, abdominal pain and fatigue or may remain asymptomatic. Children have been found to harbour large amounts of virus and can probably transmit viruses even when they are asymptomatic hence can be a prominent carrier of the disease. Even though many studies have been conducted to ascertain the reasons for the differential consequences of the disease in adults and children, the present review was done to throw light and fill the gap on the age determined variations in the outcome of covid-19.



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INTRODUCTION

Coronavirus is part of a family of enveloped positive-strand RNA viruses that infect mammals. In comparison to DNA viruses, RNA viruses have higher muta-

tion rates, indicating a better adaptation process for survival. The genome codes for four main structural proteins: spike, membrane, envelope, nucleocapsid proteins and other accessory proteins that aid in replicative processes and promote passage into cells (Schoeman and Fielding, 2019). Coronaviruses have been the cause of two large-scale pandemics in the last two decades, Severe Acute respiratory syndrome (SARS) and Middle East Respiratory Syndrome (MERS) (Hui *et al.*, 2020). The transmission of the virus from one person to another occurs via droplets as in case of other respiratory viruses (Nikolich-Zugich *et al.*, 2020). Studies have revealed that the virus has the ability to grow in aerosols for hours and survive in various surfaces for longer duration (van Doremalen *et al.*, 2020). It is believed that person to person spread of droplets is a common route the virus propagates, followed by

aerosol and fomite transmission. Another possible transmission could be via fecal-oral route (Nikolich-Zugich *et al.*, 2020). Coronavirus is more dangerous when it comes to treating a patient's mouth in case of a lesion or tumours as the chance of transmission of the disease is more while analysing a patient's oral cavity for the presence of various defects in the teeth and oral mucosa (Palati *et al.*, 2020; Hannah *et al.*, 2018; Gunasekaran and Abilasha, 2016).

There are reports of higher incidence of morbidity and mortality among patients post surgery and biopsy as they are highly sensitive and affect the entire system (Krishnan *et al.*, 2018), hence in covid-19 extra care has to be taken to prevent mortality in such individuals. Many studies report incubation period to be 5 days, while onset of symptoms may be up to 14 days after exposure, thus providing a basis for the duration of quarantine/self-isolation (Lauer *et al.*, 2020). Coronaviruses have been reported for about 15% of adult common colds with particular strains being commonly implicated such as HCoV-229E, HCoV- NL63, and HCoV-OC43. Such strains can lead to debilitation and pneumonia in elder individuals with underlying immunosuppressive conditions (Greenberg, 2016). Individuals with respiratory diseases such as asthma and COPD, if exposed to COVID-19 show an increase in severity of symptoms (El-Sahly *et al.*, 2000). Several diagnostic studies are being conducted for early detection and prevention of cancers (Shree *et al.*, 2019), similar studies can help in early detection and prevention of covid-19. A recent study has documented that COVID-19 can lead to heart injury, even in people without underlying heart issues (Paramasivam *et al.*, 2020). Surprisingly there are studies that have shown that environmental factors, including occasional climatic variability, can have a strong impact on spatio-temporal patterns of infectious disease outbreaks.

Studies have shown that though men and women have the same prevalence of COVID-19, men with COVID-19 are more susceptible to worse outcomes and death. Children with COVID-19 infection also present with similar symptoms as adults such as fever, dry cough, runny nose and nasal congestion, nausea, vomiting, diarrhoea, anosmia, abdominal pain and fatigue or may remain asymptomatic (Chan *et al.*, 2020). Immune systems of very young children, preschool children as well as teenagers vary. Similarly, the newborn infant undergoes dramatic changes when exposed to a vast novel environmental exposure (Olin *et al.*, 2018). But, newborn infants have maternal anti-viral antibodies which provide active immunity against numerous viruses and diseases including covid-19 (Pou *et al.*, 2019).

Older adults were found to be more prone to coronavirus infections and are at greater risk for mortality and morbidity, especially the elderly with comorbidities (Wang *et al.*, 2020).

Children respond in a different way to covid-19 infection and it is milder compared to adults. It is hypothesised that certain viruses in the mucosa of lungs and airways, commonly seen in children, could possibly limit the growth of SARS-CoV2 by direct virus-to-virus interactions and competition (Nickbakhsh *et al.*, 2019). An increase in medical negligence can also lead to increased mortality irrespective of the age (Uma *et al.*, 2020). Several studies and awareness surveys were done and conducted by dental students in the department but owing to the current situation (Manohar and Abilasha, 2019), the present review was done based on the age determined variations in the outcome of covid-19.

Discussion

Effect of COVID-19 on Immunity

On extensive research done on COVID-19 and its pathogenesis, many studies found that not all the exposed individuals are affected and not everyone with an active infection develops severe disease (Guan *et al.*, 2020). Covid -19 is divided into 3 stages mostly, stage I, an asymptomatic incubation period which may or may not contain the virus in detectable state; stage II, non-severe symptomatic period with the presence of virus (upper respiratory tract); stage III, severe respiratory symptomatic stage with high viral load (lower respiratory tract) (Wang *et al.*, 2020). The most common initial symptom of COVID-19 is fever, including other symptoms such as dry cough, shortness of breath, headache, muscle ache, sore throat, diarrhoea, nausea, anosmia and vomiting (Guan *et al.*, 2020) which may worsen with severe disease.

Effect on Adults and Elderly

Age is considered as an important factor for the prognosis of many diseases, including COVID-19 (Cowling *et al.*, 2006; Palati *et al.*, 2020). COVID-19 primarily occurred at the age of 30-65 with 47.7% of the patients being above 50 years according to previous studies (Yi *et al.*, 2020). Patients who were severely affected and required intense treatment had underlying comorbidities and complications and were significantly older (Wang *et al.*, 2020). Elderly patients with comorbidities do not possess an effective immune system in comparison to healthy adults, (Abdulmir and Hafidh, 2020) hence older individuals are advised maximum precaution with strict monitoring and hospitalisation.

Effect on Children

Children are more susceptible to develop pneumonia when compared to older individuals, as they do not possess adequate immune response and counteractive pathogenic mechanisms as seen in adults. Children are less capable of cell-mediated attack as they lack memory cells specific to coronaviruses. Whether symptomatic or not, such memory cells are in abundance in adults as they have been exposed to many respiratory infections, like flu, common-cold etc. caused common cold-causing coronaviruses (Gorbalenya *et al.*, 2020). But in case of the Covid-19, children are least affected due to various reasons like presence of competitive virus interactions (Nickbakhsh *et al.*, 2019), alternative immune pathways etc. still demanding more studies to obtain clearer knowledge on the course of the disease in children.

Effect on Infants

A study conducted in Hong Kong revealed that SARS, during the time of pregnancy is associated with abnormalities such as spontaneous miscarriage, preterm delivery, and intrauterine growth restriction (Wong *et al.*, 2004). Though there have been no serological or clinical reports of SARS or MERS in neonatal infections in previous studies (Shek *et al.*, 2003), evidence of vertical mother-to-child transmission in other respiratory viruses such as respiratory syncytial virus (RSV) and H1N1 have been recorded (Takahashi, 2011). Hence a similar response is expected in case of covid-19 infection in infants mainly due to the transfer of maternal anti-viral antibodies (Pou *et al.*, 2019).

CONCLUSION

Although COVID-19 presents in children in a milder form, the affected children must not be ignored. Further measures are to be taken to prevent the progression of the infection in children and the elderly. Children have been found to harbour large amounts of virus and can probably transmit viruses even when they are asymptomatic hence can be a prominent carrier of the disease. Hence this mini-review is a useful update on the age dependent factors of covid-19 which still requires extensive research due to the mysterious course of the disease.

Conflict of Interest

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