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# COVID-19 in children: A review

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## Abstract

From December 2019, SARS-CoV-2 pandemic occurred that started in Wuhan, China, initially spread in China and then globally all over the World. The COVID-19 has also increased in a number of children, but they have better prognosis and lighter course than adults. According to a study, the overall rate is 5,431 cases per 100,000 children. The prevalence of COVID-19 among children under 18 years was 2.1% and their death rate was only 0.01%. Death rate is rare in children. The majority of children have no clinical sign and symptoms; it's difficult to identify pediatric patients. The patient does not have information about epidemiologically. These patients create dangerous situation in a community to spread infection.

## Introduction

A viral disease COVID-19 is caused by SARS-CoV-2. A variety of diseases such as MERS, SARS and COVID-19 are caused by a large family of viruses known as coronaviruses. Mostly, these viruses present in birds and mammals. However, seven out of them have been discovered as human-transmitted coronaviruses. The most recent specie of coronaviruses, SARS-CoV-2 was reported in Wuhan, China in December 2019 and now has been spread worldwide [1]. The incubation period for COVID-19 is 2-14 days. The most important parameter that determines the severity and mortality rate of disease is age. December 2019, a novel infection caused by coronavirus had spread throughout in China and still has been spreading quickly over a wide area of the world [2]. Till now, this virus has been spreading swiftly to all parts of China and globally all over the world. The sequencing of viral genome, which was isolate in the lower respiratory tract of patient on January 2020, confirmed that it was a novel coronavirus. Later, the World Health Organization named this virus 2019-nCoV. Meanwhile, the National Health Commission of the People's Republic of China (PRC) formally added the disease named as COVID-19 and it is a B class infectious disease regulated in People's Republic of China Law for the inhibition [2].

NHC identified a new type of pneumonia infected with the coronavirus was known by "new coronavirus pneumonia". The Corona Virus Study Group of International Commission for Classification of Viruses titled the novel corona virus "Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)". On that day, world health organization gave the name disease caused by novel coronavirus, such as COVID-19. So in the assessment of March 2020, WHO proclaimed that the pandemic condition occur due to COVID-19 [3]. This study found that SARS-CoV-2 have its place to the novel corona virus with genus β. Its genetic traits differ significantly from the SARS-CoV and MERS-CoV. The homology of SARS-CoV- 2 and SARS-CoV is approximately 90% similar [4]. Wuhan Institute of Virology received confirmation that the SARS-CoV-2 found in bats and like SARS-CoV, enter in the body by binding with ACE-2. Consequently, the Agricultural University of South China claimed that CoV-2 and Malay pangolin coronavirus had 98% similarity in amino acid and 89% similarity in nucleotide in identical receptor-binding fragments. Zhou et al. [5] used a cryo-electron microscope for first time to examine the entire structure of the SARS-CoV-2 receptor, which is known as ACE-2, and is useful in the development of inhibitor. Thi et al suggested that SARS-CoV-2 controlled on the basis of genetic structure of the virus, which is necessary to predict its trends in viral disease development [6]. On March 03, 2020, Tang et al [7] explain about the genome development of coronavirus predicted that SARS-CoV-2 had two subtypes L and S, and that viral strain had about 149 point mutations more frequently in adolescence of the Wuhan outbreak; so it was ventured that this disease is most contagious and can spread from one person to another person.

In the first wave of COVID-19 outbreak infection, young patients were quite rare and were not considered susceptible. However, with the passage of time the onset of family clump, children with COVID-19 infection steadily emerged. Newborns affected with COVID-19 infection are due to COVID-19 affected mother. According to a study, the overall rate is 5,431 cases per 100,000 children. The prevalence of COVID-19 among children under 18 years was 2.1% and their death rate was only 0.01%.

Since this group of children is frequently vulnerable to upper respiratory tract infections, the delay in pediatric attendance due to the development of their immune system is still vague. Otherwise, under the wild-level spread of COVID-19 and the low frequency of diagnosis by the throat swab COVID-19 nucleic acid test, a distinction remains to be made between how it can be distinguished from other mutual pathogens for respiratory tract infections in pediatric patients [8].

## Epidemiology of COVID-19

Despite its global spread, the epidemical patterns of COVID-19, particularly in pediatric patients remain mostly unclear. Dong et al examined the transmission patterns of COVID-19 in children with their epidemiological characteristics in China.

Initially, cases were diagnosed based on clinical manifestations and history exposure [8] [9]. A child has been exposed to a patient with a COVID-19 or lives in an epidemic zone in the past 2 weeks in the city having COVID-19 had been reported as high, moderate and low risk due to the probability of the disease. However, a child is at high risk for two of these situations including respiratory illness, fever, gastrointestinal symptoms or fatigue. However, most of these children may have exposed to their family or

other children with COVID-19, specifies human-to-human transmission. Evidence for such a route of transmission has seen in adult patients as well [10], [11], [12]. The clinical indices of pediatric COVID-19 may not be as severe as in adult patients.

In another study of epidemiology of children COVID-19 in China, most of the children are exposed to other infected children and their infected family members. It clearly showed that person to person transmission. The person to person transmission evidence has been also reported in adults [13].

## Initial Characterization of Pediatric Disease

Initial data focus on severe respiratory manifestations observed primarily in adults, with scarce preliminary information on the severity of COVID-19 in children [14]. The assumptions of Dong et al [15] are included in this problem Pediatric streak of 2,000 children with suspected or confirmed COVID-19 victims.

It was observed that about 4% of definite cases had asymptomatic infection, and this frequency positively implies the real incidence of asymptomatic infection. In asymptomatic children, 5% had suffered from dyspnea and 0.6% developed ARDS. Preschoolers and infants are more on the verge of severe clinical conditions as compared to older children Manifestation.

Pediatric patients have very minute chances to become seriously ill than adults, there is a subpopulation of children who are at higher risk of developing more serious diseases. The data on the severity of disease are reliable with information of the non-COVID-19 coronavirus [16].

It has been evidenced that the coronavirus was found more in children with ARDS than in human metapneumovirus [17] and 10% of children were affected with coronavirus respiratory infections [18]. Younger age, underlying lung disease, and a compromised immune system have been related with more severe outcomes for non-COVID-19 coronavirus infections in children [19].

It is difficult to differentiate the causal risk of severe COVID-19 disease in children. Children have a coronavirus detected by the respiratory tract can co-infect the virus for up to 2/3 of the time [18]. In a study by Dong et al [15], tests for some other viruses are not consistent and about 2/3 of these cases are diagnosed clinically. Additionally, children without biological confirmation have more chances to develop serious illness than those children diagnosed with COVID-19, possibly because of their signs caused by few other pathogens. The transmission of this virus in community is spread by those children.

There is a proof of fecal excretion for some weeks after diagnosis [20], leading to concerns about fecal-oral transmission of the virus, especially in non-toilet infants and children, and replication of viral components. In the gastrointestinal (GIT) tract [21], persistent infiltration of nasal and facial secretions has a significant impact on community expansion in children's centers, schools and homes. Though erect transmission has not been informed [22], still many babies born to mothers who are suffered with COVID-19 are delivered surgically and are hastily detached from mothers. Many of the infectious diseases predominate the respiratory disease in pregnant women can cause deprived fetal outcomes [16].

## Children are linked in the transmission chain

Infants and children are not given special consideration in the case of the COVID 19. Recent study in China found that those children who are under ten years comprised about 1% of the COVID-19 cases [20], parallel to SARS-epidemic ratio, CoV and MERS-CoV [23, 24]. Typically, infants as well as adolescent children have more chances to being hospitalized after Respiratory Tract Infections (RTI) with viruses like the respiratory syncytial virus and influenza virus [25] . It is believed that under-developed immune and respiratory systems contributes to chronic viral diseases [25]. Hence, the lack of pediatric patients with COVID-19 worries doctors. Hence the adaptive strategies for caring for children are lacking due to the inadequate number of pediatric patients who suffered with COVID-19 [26].

The children are very less exposed to SARS-CoV2 infection, but often do not have an identifiable disease that increases the likelihood that children will increase transmission of the virus. If children are important for the spread and spread of the virus, social and public health guidelines can be established (e.g., avoiding interaction with parents) to minimize the transmission and to protect susceptible populations. The basic role of children played in transmission chain urgently needs further research [26].

## Newborn infants with COVID-19

National Health Commission (NHC) of China reported that 3 cases of newborns had been reported [27]. Meanwhile, the number of cases of adults and children in China is nearly eighty thousand. The first baby had suffered from fever and coughing for about 3 days, while the second baby was suffering from cold and vomited for about a week. The third child, at the age of 30 while diagnosed after giving birth by the sick mother, had shortness of breath however no symptoms of fever have.

Schwartz examined 5 publications of China and able to recognize 38 pregnant women from 39 generations [28]: About nine of these generations were reported by Chen et al. [29] and 10 others by Zhu et al. [30]. Out of these 39 generations, 30 people were verified for COVID-19 and fortunately none of them had positive case. Schwartz found that no pregnant women were suffered with chronic pneumonia. Almost 38 pregnant women have mild course disease is consistent with WHO that examined 149 pregnant women and observed no risk factor for serious COVID-19 infection [31]. Though, the presence of COVID-19 particularly during pregnancy can continue to affect the fetus, including fetal stress, the possibility of preterm birth, and shortness of breath [30].

Children who have less outside activities and their international travelling is not as much as the adults faced these basic reasons make the children less susceptible to COVID-19 [32].

The second reason for the comparative resistance of COVID in children or to certain infection spreading diseases is still unknown. It has been proposed that the mature alterations in axonal transport system might illuminate the comparative resistance of juvenile rats to paralysis prompted by poliovirus [32].

## Critical cases of COVID-19 in children

Mostly, the COVID-19 in children is less critical than in adults. Normally, children are treated at home and may have less chance of being exposed to sick patients. ACE2 is a cellular receptor for SARS-CoV [33]. SARS-CoV-2 has same homology of amino acid as in SARS-CoV and is likely to use a receptor known as ACE2. ACE2 may be a COVID-19 cellular receptor [34], [35] . There is speculation that the children are less sensitive to COVID-19, because the maturity and function of receptor ACE2 may be lower in children than in adults [36]. In addition, children often develop respiratory infections (RSV) in winter and may have antibodies with higher levels against the virus than adults. Moreover, the immune system of children is still on developing stage and can react differently against pathogens than the immune system of adults [32].

## Diagnosis

COVID-19 is diagnosed primarily using a nose or throat swab or a positive blood sample for nucleic acid COVID-19 using RT-PCR test. Another diagnosis includes airway genetic sequences or blood samples according to SARS-CoV2 [37]. Many of case reports describe comorbidity in children affected with COVID-19 [37] .Pediatric patients contact with COVID-19 through well-defined routes of transmission, such as exposure history with members of family or epidemic areas [38]. Yuanyuan Dong et al., observed that the boys were more affected with COVID-19 than girls [39] [40]. However, there was not any gender-specific differences were observed. The average age of children affected with COVID-19 was 7 years, between days 1 to 18 years. These findings suggest that all childhood ages are vulnerable to COVID-19 [41] .

## Management and treatment

Most of the publications commenting on therapies mention sympathetic measures, including oxygen therapy and antibiotics for bacterial super infection [42]. Some investigators recommend antiviral therapies. Antiviral therapy is mostly used in severe condition of patients, but there is no information on its effectiveness in children [43] [44].

A Chinese consensus group recommends hospital discharge if three criteria met. They showed the child's had normal body temperature for three days, better respiratory symptoms, and a negative COVID-19 test. The importance of blocking transmission routes was also stressed by this group [45]. The significance of possible stool displacement remained unclear [46].

Others examined the secondary consequences of closing schools and locking children in their homes. The studies suggested that these considerations can have a negative impact on the physical and mental health of children. These adverse effects include longer screening times, irregular sleep, an unhealthy

diet, leading to weight gain and loss of cardiorespiratory fitness [47]. It has been reported that quarantine and isolation of children after a health disaster can significantly increase the risk of post-traumatic stress disorder.

## Conclusion

Children with all ages appear to be vulnerable to COVID-19 and insignificant gender differences. Although in general the symptomatic appearance of COVID-19 children's cases has still visible. Youngsters, especially infants, are less severe and vulnerable than adult patients for infection.

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### Conflict of interest

The authors declare no conflict of interest.

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