

Symptoms of COVID-19 in children referring to Hazrat Ali Asghar Children's Hospital in Tehran during the COVID-19 pandemic in 2021

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Abstract

Introduction: In December 2019, the new coronavirus was first detected in the city of Wuhan, China, and then spread rapidly throughout the world, so that the World Health Organization declared this disease a pandemic. In this article, the findings related to the clinical symptoms of COVID-19 in children are mentioned.

Method: After obtaining the code of ethics from the ethics committee of Iran University of Medical Sciences and entering Hazrat Ali Asghar Children's Hospital in Tehran, sampling was started. Sampling was performed using the available method and a total number of 120 children, who had positive PCR, were included in the study. After obtaining informed consent from the child and parents regarding their clinical symptoms, their clinical files and tests were examined.

Analysis: In presenting symptoms, the most common symptom of covid-19 in children was fever, with 95% frequency in children that were studied. The least frequent symptom was abdominal pain, and only 20% of the cases in the study had this symptom. The male gender and the age of 10-20 years were more frequent. In the lab the experiments in the field of covid-19 were performed and the findings were obtained in the form of range or interval in the table. 120 examined samples had positive PCR results and only 20 of them required admission to the intensive care unit (ICU).

Conclusion: Fever was the most common symptom of COVID-19 in children. According to available data, 95% of children with positive PCR had a fever. After fever, the cough was one of the most common symptoms with 90% frequency. In the lab the experiments in the field of covid-19 were performed and the findings were obtained in the form of range or interval in the table. 120 examined samples had positive PCR results and only 20 of them required admission to the intensive care unit (ICU). d-dimer was positive in 60% of people, only 10% of children had normal LDH, and Cpk was normal in 60% of the samples. 5% of the cases experienced dehydration and 15% had respiratory problems

Keywords: Symptoms of Covid-19, Children, Omicron

Introduction

In December 2019, an outbreak of a new infectious disease occurred in Wuhan, Hubei Province, China(1), which was caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (2). The coronaviruses include a

large family of single-stranded and zoonotic RNA viruses, which belong to the Coronaviridae family (3). They can infect all kinds of animals (including livestock, companion animals, and birds), and cause serious respiratory, intestinal, cardiovascular, and neurological diseases in them (4, 5). In humans, CoVs mostly cause respiratory and gastrointestinal symptoms, ranging from the common cold to more severe illnesses such as bronchitis, pneumonia, severe acute respiratory distress syndrome (ARDS), blood clotting, multiple organ failure, and death. (6, 7).

Due to the rapid spread of this virus with consequences on an international scale, COVID-19 was declared a pandemic by the World Health Organization on March 11, 2020 (2). Recent data reported from the Chinese Centers for Disease Control and Prevention show that among the 44,672 confirmed cases of COVID-19 up to February 11, 2020, 416 (0.9%) were aged 1–10 years, and 549 (1.2%) were aged 10–19 years (8).

Clinical symptoms of COVID-19 are still being recorded and collected, although most infected patients show symptoms of dry cough, which is usually accompanied by fever (9). The reasons for children's relative resistance to some infectious diseases are unclear. It has been suggested that changes related to axonal transport may explain the relative resistance of immature mice to virus-induced paralysis (10). In addition, children have a more active innate immune response, have a healthier respiratory system because they are not exposed to cigarette smoke and air pollution as much as adults, and have fewer underlying disorders (11). Interesting findings show that children may also be less susceptible to COVID-19 (12). But in another study, it was stated that children of any age are susceptible to COVID-19 and there is no significant difference between genders. Although the clinical manifestations of COVID-19 in children showed a sharper decrease following treatment compared to adult patients, young children, especially infants, were exposed to infection (13). The immune systems of children and adults are different considering their composition and functional reactivity. In addition, there are differences in the immune system of very young children, preschool children, and adolescents. In the first weeks of life, the human newborn baby is exposed to a new environment and undergoes dramatic changes. (14) Another difference between newborn babies and older children is the presence of some maternal antibodies in the first months of life. However, these antibodies do not include new viruses such as SARS-CoV2 (15). Thus, children can probably transmit viruses, and they have been found to harbor large amounts of the virus, even without showing symptoms (16). Additionally, considering the long incubation period (14 - 14 days) of covid-19 (17), children can be asymptomatic or show mild and nonspecific symptoms. Therefore, all children and their parents should be considered potential carriers of SARS-CoV-2, unless proven otherwise. COVID-19 can be transmitted through direct and indirect contact, mainly through respiratory droplets, saliva, and blood, as well as through contact with mucous membranes and infected foams (18, 19). A great number of studies have been performed on the symptoms and characteristics of adults with COVID-19. Although some of these studies included a smaller number of children (20, 21), general interpretation is challenging due to the multifaceted nature of worsening as a result of the disease in children (22). The most widely reported clinical symptoms include cough, headache, myalgia, anosmia, and diarrhea (17, 23). However, few skin findings associated with the virus have been described (24). During the COVID-19 pandemic, acute colds were observed in children and adolescents, which usually did not require treatment, and Etiopathogenesis was unknown. (25). Skin lesions on toes, feet, and fingers with painful skin lesions were later reported in a few adolescents and older adults. (26) These impressions are only hypothetical, and further confirmation is needed. Until it is confirmed, we recommend that if you encounter this type of lesion, you should investigate possible contact with COVID-19 and, in any case, ask about the presence of fever or cold in the weeks before the appearance (Landa et al. al., 2020). The authors reported that 32.1% of children had a fever higher than 38°C, and most other studies have shown that fever in children is usually lower than 39°C. The most common symptoms are cough (48.5%), pharyngeal erythema (46.2%), and fever of at least 37.5 degrees Celsius (41.5%) (27).

A study by Dong et al examined 2143 children using laboratory tests along with the examination of clinical symptoms and history. Of these, 34.1% had a laboratory-confirmed disease, while the rest had suspected clinical disease (28), and the symptoms included diarrhea (8.8%), fatigue (7.7%), rhinorrhea (7.6%), and vomiting (6.4 %). Four of 171 children (2.3%) had an oxygen saturation of less than 92%. It should be noted that some sources of COVID-19 have defined low oxygen saturation as below 93% or 94% (27).

According to reports from China, COVID-19 in children is usually mild and has few symptoms. (29) In a systematic review, it is stated that children seem to have a milder disease course and a better prognosis than adults. Also, death is very rare in them. (30) Early studies in the adult population indicated elevated liver enzymes, anemia, and increased inflammatory markers, such as red blood cell sedimentation rate, C-reactive protein, procalcitonin, and sometimes elevated blood sugar (31). Additionally, following the reduction of neutrophils, white blood cell (WBC) count is usually normal or decreased (32). Data on laboratory markers in children with COVID-19 are limited (33). Children with special needs (eg, due to cerebral palsy, epileptic encephalopathy, severe syndromic diseases, or

iatrogenic immunosuppression or disease) are potentially at greater risk of severe disease. (29) This study was conducted with the aim of investigating the symptoms of covid-19 in children referred to Hazrat Ali Asghar Children's Hospital in Tehran during the Covid-19 pandemic.

Method

After obtaining the code of ethics (IR.IUMS.REC.1399.671) from the ethics committee of Iran University of Medical Sciences and entering Hazrat Ali Asghar Children's Hospital in Tehran, sampling was started. Sampling was performed using the available method and a total number of 120 children, who had positive PCR, were included in the study. After obtaining informed consent from the child and parents regarding their clinical symptoms, their clinical files and tests were examined.

Analysis

120 studied samples had positive PCR results, and 20 of these cases needed ICU, and their hospitalization period was from 4 to 8 weeks. Also, 25% of the patients had influenza. Also, 5% of the sample had dehydration, and 15% had respiratory problems.

Presenting symptoms	Percentage	Gender		Age	
		Boys	Girls	0-10	10-20
Fever	95%	56%	44%	55%	45%
Total	95/100	56/100	44/100	55/100	45/100
Cough	90%	40%	60%	35%	65%
Total	90/100	40/100	60/100	35/100	65/100
Headache	45%	45%	55%	10%	90%
Total	45/100	45/100	55/100	10/100	90/100
Rash	25%	50%	50%	50%	50%
Total	25/100	50/100	50/100	50/100	50/100
Diarrhea	65%	35%	65%	30%	70%
Total	65/100	35/100	65/100	30/100	70/100
Vomiting	40%	60%	40%	45%	55%
Total	40/100	60/100	40/100	45/100	55/100
Nausea	35%	30%	70%	20%	80%
Total	35/100	30/100	70/100	20/100	80/100
Abdominal	20%	70%	30%	15%	85%
Total	20/100	70/100	30/100	15/100	85/100
Sore throat	85%	45%	55%	50%	50%
Total	85/100	45/100	55/100	50/100	50/100
Rhinorrhea	75%	41%	59%	50%	50%
Total	75/100	41/100	59/100	50/100	50/100
Conjunctivitis	30%	25%	75%	40%	60%
Total	30/100	25/100	75/100	40/100	60/100
Sneezing	70%	30%	70%	45%	55%
Total	70/100	30/100	70/100	45/100	55/100
Nasal congestion	65%	29%	71%	45%	55%
Total	65/100	29/100	71/100	45/100	55/100
Myalgia	65%	34%	66%	56%	44%
Total	65/100	34/100	66/100	56/100	44/100

Vital signs	Frequency	Gender		Age		
		Boys	Girls	0-10	10-20	
1	HR	120(34%)	56%	44%	55%	45%
2	RR	28(65%)	34%	66%	20%	80%
3	T	37(54%)	40%	60%	35%	65%
4	Sat o2	91%(43%)	40%	60%	25%	75%

5	BP	85/60(21%)	45%	55%	10%	90%
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According to the above table and the vital signs and frequencies based on the data in HR, 56% of the boys had an HR of 120. Also, this number was higher in the ages of 0-10 years. The frequency of RR in girls was 66% and the number was 28. The age of 10-20 years was the most frequent with 80%. In vital signs number 3 or T, girls with 60% and 10-20 years age range with 65% frequency had a higher frequency in number 37. Considering number 4 or sat o2, girls with 60% and 10-20 years age range with 75% had the highest frequency in sat o2 91%. BP had a higher frequency with 21% in a fraction number of 85/60, and the girls with 55% and the age of 10-20 years with 90% had the highest frequency.

	Test			
	4.5-7.5	7.5-11.5	11.5 and higher	
Wbc count	20%	50%	30%	
DOMAIN	20-40	40-50	50 and higher	
Absolute lym count	75%	5%	20%	
DOMAIN	55-70	70-80	80 and higher	
Nuet count	99%	0%	1%	
DOMAIN	0	1	NON	
Band	40%	60%	NON	
DOMAIN	9-11	11-13	13 and higher	
hb	70%	25%	5%	
DOMAIN	90-210	210-330	330 and higher	
plt	45%	40%	15%	
DOMAIN	10-25	25-40	40 and higher	
Ast	30%	50%	20%	
DOMAIN	10-30	30-50	50 and higher	
Alt	35%	45%	20%	
DOMAIN	5-20	20-35	35 and higher	
Bun	49%	40%	11%	
DOMAIN	0.5-1	1-1.5	1.5 and higher	
Cr	67%	30%	3%	
DOMAIN	norm	15-25	25 and higher	
Crp	35%	10%	55%	
DOMAIN	NEG	POS	NON	
Procal	56%	44%	NON	
DOMAIN	NORM	120-150	150 and higher	
cpk	60%	25%	15%	
DOMAIN	norm	26-36	36 and higher	
Cpk-mb	30%	55%	15%	
DOMAIN	NEG	POS	NON	
troponin	91.5%	8.5%	NON	

DOMAIN	60-170	170-280	280 and higher
Ldh	10%	45%	45%
DOMAIN	NEG	POS	NON
d-dimer	40	60	NON

Three parts of the tests were measured qualitatively, and d-dimer was positive in 60% of people. Also, troponin was negative in 91.5% of people and positive in 8.5% of people.

The level of Ldh in 45% of people was between 170-280, in 45% of other people was 280 and above, and in only 10% of cases, the level of Ldh was in the normal range of 60-170. The normal range of Ldh in children is 60 to 170, and only 10% of children were in this range.

In 45% of people, Alt was reported between 30-50. In 50% of people, Ast levels were in the range of 25-40. And in 45% of people, Plt was the range of 90-210.

Cpk was normal in 60% of the samples, and cpk-mb was in the normal range in only 30% of patients. CRP of 55% of the samples was above 25. The rest of the test results are generally obtained in the table.

Discussion

The present study was conducted with the aim of investigating the symptoms of covid-19 in children referred to Hazrat Ali Asghar Children's Hospital in Tehran during the Covid-19 pandemic. According to the results, 95% of children with positive PCR had a fever, and after that, cough was one of the most common symptoms in children with Covid-19, and 10% of children had normal LDH. In adults with COVID-19, up to 83.2% had lymphopenia (17, 31, 34). In children infected with SARS-CoV-2, peripheral white blood cell counts and absolute lymphocyte counts were mostly normal, CRP was normal or slightly elevated, and Liver enzymes were high in some children (35). Studies on SARS in infants and children have reported that the clinical course and prognosis differ between pediatric and adult SARS patients. Young children (less than 12 years) generally experienced a less aggressive clinical course than adolescent or adult patients. (36) In our study, out of the 120 samples studied, 20 patients needed ICU, and the rest were admitted to the normal ward and did not have severe clinical symptoms. A study by Sankar et al. in April 2020 in New Delhi, examined 171 children with Covid-19 and positive PCR. Their symptoms included cough that was observed in 48%, pharyngeal erythema in 46.2%, fever in 41.5%, tachypnea in 38.7%, diarrhea in 8.8%, rhinorrhea in 7.6%, fatigue in 7.6%, and vomiting that was reported in 6.4% of patients. The frequency of asymptomatic infection, upper respiratory tract infection, and pneumonia was 15.8%, 19.3%, and 64.9%, respectively, and one child died. The average age of involvement and infection was 7 years (range: 2-13 years), and 57% of cases were boys. Among the confirmed cases, the frequency of asymptomatic, mild, moderate, severe, and critical infections was 12.9%, 43.1%, 41%, 2.5%, and 0.4%, respectively. (37)

In the current study, fever was the most common symptom of Covid-19 in children. According to the available data, this symptom is more common in boys than in girls, and 56% of boys and 44% of girls suffer from this symptom. Also, children with 0-10 years of age suffer from this symptom by 55% more than other ages. After fever, cough was one of the most common symptoms in children with coronavirus with 90% frequency. This symptom was more common in girls (60% frequency). Also, in the ages of 10-20, 65% more people suffer from this symptom compared to other age groups. The least common symptoms were abdominal symptoms with 20% frequency, and the frequency of these symptoms was 70% more in boys than girls. Also, children with 10-20 years of age suffer from abdominal symptoms more than other ages (85%). Another less common symptom was skin rashes, which affect 25% of all people. It was observed in half of the girls and half of the boys, and half of them occurred at the ages of 0-10 years and half of them at the ages of 10-20 years. In general, the symptoms of COVID-19 are more common in girls than boys, and children with 10-20 years of age compared to other age groups.

A systematic review was conducted by Ludvigsson in March 2020 in Sweden, and the aim of this study was to define the available evidence on covid-19 in children. It was found that covid-19 is either rare in children or often goes undiagnosed because the cases of this age group are often asymptomatic. It is estimated that 86% of all primary covid-19 infections in China remained undiagnosed, and most of them might have been the sources of many cases of COVID-19 (38).

A study conducted by Devrim et al. in July 2020 in Turkey, and the findings regarding the cases with 18 years of age and younger indicated that in this age group, the rate of disease attacks is low and about 2% have been reported. The largest incidence rate in children, which has been published previously, showed that 5.2% of cases had severe disease and 6% had critical conditions with respiratory failure, multiple organ failure, encephalopathy and heart

failure, abnormal coagulation, or acute renal failure. It should be noted that almost 40% of the children in this study were less than 5 years old. Children may not be diagnosed because they are asymptomatic. Thus, they can be the primary source of transmission and spread of Covid-19 disease (39).

In the study of laboratory disorders in children infected with coronavirus, the data related to laboratory markers in children infected with COVID-19 were rare. An exception was the study conducted by Henry et al., which summarized the findings of 12 different studies on 66 children. It was found that 69.2% of children had a normal leukocyte and neutrophil count, and neutropenia was rare (6.0%). Also, only two children (3.3%) had lymphocytopenia. The levels of C-reactive protein and procalcitonin were increased in 13.6% and 10.10% of cases, respectively (33). In the present study, 75% of cases had normal lymphocytes, and in 99% of patients, the neutrophils were in a normal range.

The Covid-19 epidemic is currently spreading globally. Further research and surveillance are important to help understand the clinical features and natural history of 2019-nCoV infection in children. (40, 41)(42)(43)

Conclusion

Fever was the most common symptom of COVID-19 in children. According to available data, 95% of children with positive PCR had a fever. After fever, the cough was one of the most common symptoms with 90% frequency. In the lab the experiments in the field of covid-19 were performed and the findings were obtained in the form of range or interval in the table. 120 examined samples had positive PCR results and only 20 of them required admission to the intensive care unit (ICU). d-dimer was positive in 60% of people, only 10% of children had normal LDH, and Cpk was normal in 60% of the samples. 5% of the cases experienced dehydration and 15% had respiratory problems

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