

Comparison of clinical characteristics of COVID-19 between children and adult

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Article Info

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Abstract

The aim of the study was to evaluate and compare the clinical characteristics of COVID-19 infection in children and adult. This observational cross-sectional study was conducted in multiple corona dedicated hospitals, situated in Dhaka, Bangladesh from April 2020 to January 2021. Data of COVID -19 positive hospitalized patients were collected in a pre-tested questionnaire during hospital stay with proper protective measures. Clinical characteristics of the COVID-19 positive hospitalized children and adult patients were evaluated. Approval was taken from institutional review board of respective institutes. Statistical analyses of the results were obtained by using SPSS-25. In this study the male-to-female ratio was 1:1.6 and 2.8:1 in child and adult patients respectively. More than three quarter (75.4%) of subjects had family members affected before the illness in the child group and more than half (50.9%) cases in the adult group. History of contact or exposure with any symptomatic case was present in 61.4% cases in the adult group but only 14% in the child group. The mean duration of illness was less (9.1±8.6 days) in the child group than in the adult group (14.8±9.5 days). The difference was statistically significant ($p<0.05$) between the two groups. The most common symptoms in the child group were fever (71.9%), cough (77.2%) and runny nose (52.6%) whereas in the adult group most common symptoms were fatigue, excessive tiredness, or lethargy (80.7%), cough (77.2%) and anosmia (70.3%). There were statistically significant ($p<0.05$) differences in symptoms between the two groups. Raised body temperature ($>101^{\circ}\text{F}$) was found in the majority (86.0%) subjects' in the child group than in the adult group where it was 50.9%. The mean SpO_2 without oxygen was $96.8\pm 1.2\%$ in the child group and $92.8\pm 5.7\%$ in the adult group. Ten (17.5%) subjects had a symptom-free total illness in the child group and 3(5.3%) in the adult group. The difference in temperature, SpO_2 without oxygen, consciousness, and symptom-free total illness were statistically significant ($p<0.05$) between the two groups. In adult group 94.7% patient required hospital admission according to guideline, but in child group only 40.3% actually needed hospitalization, rest of the children got admitted along with family member or due to other diseases. Fever, cough and runny nose were more frequent symptoms in children however, fever, fatigue, excessive tiredness, anorexia, nausea, vomiting, anosmia, diarrhoea and body ache were more common in adult patients. These differences were statistically significant. In comparison to COVID-19 infected adult cases, infected children had higher oxygen saturation (without additional oxygen) by pulse oximeter.

Introduction

Since the outbreak of the coronavirus disease 2019 (COVID-19) in Wuhan City, China, a total of 109,463,210 confirmed cases and 2,416,661 deaths have been reported globally as of February 16, 2021, and in Bangladesh, it was 541434 and 8298 respectively.¹

COVID-19 has spread rapidly across the globe. The novel coronavirus has been named "Severe Acute Respiratory Syndrome Coronavirus-2" (SARS-CoV-2), whereas the disease associated with it is referred to as COVID-19. Full- genome sequencing analysis indicated that SARS-CoV-2

has 89% nucleotide identity with bat SARS-like-CoVZXC21 and 82% with that of human SARS-CoV-2. Human-to-human transmissions has accounted for most of the infections, including among health careworkers.³

The main clinical features of adult patients included fever, dry cough, dyspnea, myalgia, fatigue, normal leukocyte counts or leucopenia, and radiographic evidence of pneumonia.⁴ The preliminary data have been focused on severe respiratory manifestations, which are seen predominantly in adults. The initial data were scant and not much studies were available on the burden of COVID-19 in children.⁵

Li-Na Ji et al showed that children infected with SARS-CoV-2 may have variable symptoms, which may be partly related to the previous health status and interval from onset to consultation and comorbidities.⁶

Another systematic literature review⁷ on the current knowledge of COVID-19 in children showed that children have so far accounted for 1%-5% of diagnosed COVID-19 cases, the incubation period was about two days (2-10 days), and they often have milder disease than adults.

Fever and respiratory symptoms were very common, but fewer children seem to have developed severe pneumonia. Unlike adults, elevated inflammatory markers were less common in children, and lymphocytopenia seemed rare. Suggested treatment included providing oxygen, inhalations, nutritional support, and maintaining fluids and electrolyte balances. Most of the children recovered within 1-2 weeks and death were very rare.^{7,8}

Experts recently have formulated a recommendation for the diagnosis and treatment of COVID-19 in children, which is of paramount importance for clinical practice.^{9,10} Owing to the limited number of pediatric cases and experiences, these recommendations or guidelines were based mainly on standards and experiences with adult patients.⁹ So objective of this study was to evaluate and compare the clinical characteristics of pediatric and adult COVID-19 patients.

Methods

After the approval of the Institutional Review Board of Bangabandhu Sheikh Mujib Medical University, Kurmitola General Hospital and Shaheed Suhrawardy Medical College Hospital, this observational cross sectional study was conducted in these above mentioned COVID -19 dedicated hospitals situated in Dhaka, Bangladesh.

Hospitalized COVID-19 patients confirmed by RT PCR aging from 1 to 15 years enrolled as children group. Similar number of COVID-19, RT-PCR positive confirmed adult case were collected by Similar number of Corona virus infected adult patient confirmed by RT-PCR test positive who were admitted in hospital were enrolled in the study by random selection after taking in informed consent.

During the period from April 2020 to January 2021 a total of 57 children and 57 adult patients were enrolled in this study. Clinical characteristics of the COVID-19 positive hospitalized children and adult patients were evaluated. All findings were collected in a structured data collection sheet during hospital stay with taking effective safety measures.

All data from adult were reviewed by one internal medicine specialist, and data from children were reviewed by one pediatrician from each center. Data was analyzed using Statistical Packages for Social Sciences (SPSS-25). Numerical parameters were expressed by mean and standard deviation. The results were presented in tables, figures, and diagrams etc. Unpaired test and Chi-square test were calculated. A p value of ≤ 0.05 was considered significant for this study.

A confirmed case was defined as - a patient in whom SARS-CoV-2 was detected in nasopharyngeal swab by RT-PCR.

Results

In this study it was observed that (Table - I) nearly half of the affected children (43.9%) belonged to age group >10 years. The mean age in child group was 8.48 ± 5.24 years with ranged from 0.1 to 15 years. Almost two third (61.4%) child was female and 35(38.6%) male. More than half (59.6%) child came from urban area.

Socio-demographic characteristics	Number	Percentage
Age (in years)		
≤ 1	7	12.3
$>1-5$	12	21.1
$>5-10$	13	22.8
>10	25	43.9
Mean \pm SD	8.48 \pm 5.24	
Range(min,max)	0.1,15	
Sex		
Male	22	38.6
Female	35	61.4
Residence		
Urban	34	59.6
Semiurban	20	35.1
Rural	3	5.3

In the adult group the mean age was 57.33 ± 15.3 years with ranged from 25 to 88 years with a male predominance (73.7%) (Table-II).

Socio-demographic characteristics	Number	Percentage
Age (in years)		
$>18-30$	2	3.5
31-40	9	15.8
41-50	9	15.8
51-60	9	15.8
61-70	18	31.6
>70	10	17.5
Mean \pm SD	57.33 \pm 15.3	
Range(min,max)	25,88	
Sex		
Male	42	73.7
Female	15	26.3
Residence		
Urban	29	50.9
Semiurban	18	31.6
Rural	10	17.5

Table-III					
Comparison of disease characteristics of child and adult group (n=114)					
History of contact or exposure	Child (n=57)		Adult (n=57)		p value
	N	%	N	%	
Family member affected during the illness	43	75.4	29	50.9	a0.003s
Contact/Exposure with any symptomatic case	8	14.0	35	61.4	a0.001s
Exposure to any person that lately diagnosed COVID-19 positive	5	8.8	21	36.8	a0.001s
Days in between exposure and symptoms					
Mean±SD	6.6±1.7		5.9±2.8		b0.109ns
Range(min,max)	5,10		2,14		
Duration of illness (days)					
Mean±SD	9.1±8.6		14.8±9.5		b0.001s
Range(min,max)	3,30		4,60		
Duration of illness before hospitalization					
Mean±SD	6.1±0.8		6.25±2.6		
Range(min,max)	(4,8)		2,13		
Totally Asymptomatic cases					
Yes	10	17.5	3	5.3	a0.039s
No	47	82.5	54	94.7	

In this study, It was observed that (Table-III) three fourth (75.4%) subjects in child group had affected family member during the illness whereas in adult group it was 50.9%. Contact exposure with any symptomatic cases was found in 14% in child group but 61.4% in adult group ($p<0.05$). The mean duration of illness was less (9.1 ± 8.6 days) in child group than in adult group (14.8 ± 9.5 days.) The difference was statistically significant ($p<0.05$) between two groups. Totally asymptomatic during the course of illness is much more in

child group (17.5%) than the adult group (5.3%) and the difference was statistically significant ($p<0.05$)

Figure 1 showed most common symptoms in child group was cough (77.2%), fever (71.9%) and runny nose (52.6%) whereas in adult group most common symptoms were Fatigue, excessive tiredness or lethargy (80.7%), cough (77.2%) and anosmia (70.3%), fever (40.4%), body ache (47.4%) shortness of breath (42.1%) and diarrhea (28.1%).

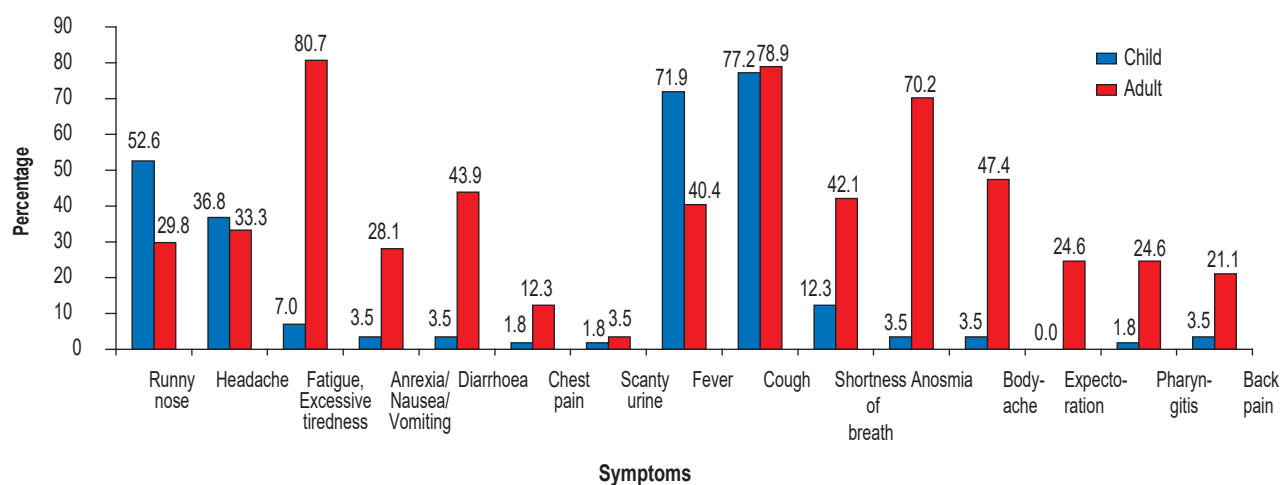


Figure 1: Bar-diagram showing distribution of the study subjects by symptoms

Table-IV					
Comparison of the study subject by their examination findings (n=114)					
Examination findings	Child (n=57)		Adult (n=57)		p value
	N	%	N	%	
Anaemia					
Mild	12	21.1	13	22.8	a0.757ns
Moderate	3	5.3	2	3.5	
Absent	42	73.7	33	57.9	
Heart rate/Pulse (/min)					
Mean±SD	92.0±7.5		87.3±12.2		b0.015s
Range(min,max)	80,100		58,120		
Respiratory rate					
Mean±SD	32.0±2.5		23.5±6.2		b0.001s
Range(min,max)	28,56		14,38		
BP					
Normal	56	98.2	26	45.6	a0.001s
Hypertension	0	0.0	15	26.3	
Hypotension/Non recordable	1	1.8	2	3.5	
Temperature (F)					
≥101.5	8	14.0	23	40.3	a0.001s
<101	49	86.0	34	59.7	
SPo2 without oxygen (%)					
Mean±SD	96.8±1.2		92.8±5.7		b0.001s
Range(min,max)	95,98		74,99		
Added sound					
Crepitation	11	19.3	5	8.8	a0.211ns
Rhonchi	5	8.8	7	12.3	
Basal creps	4	7.0	9	15.8	
No	37	64.9	36	63.2	

s= significant

ns= not significant

^ap value reached from Chi-square test^bp value reached from Unpaired t-test

It was observed that the mean heart rate/pulse and respiratory rate was higher in child group than adult, but that was within physiological limit for age group. Majority (98.2%) subjects had normal blood pressure in child group but only in 45.6% in adult group. High grade temperature (>101.5° F) was present only in 14% children, but in adult group it was 40.3%

cases (p<0.001). Without additional oxygen, the mean SPo2 remain higher (96.8±1.2%) in child group than in adult group (92.8±5.7%). The presence of hypertension, raised temperature, SPo2 without oxygen, SPo2 with oxygen, were statistically significant (p <0.05) between two groups (Table -IV).

Table-V					
Comparison of the study subject by associated co-morbidities (N=114)					
History related to co-morbidities	Child (n=57)		Adult (n=57)		p value
	N	%	n	%	
Asthma	5	8.8	6	10.5	0.751ns
Hematological disease	1	1.8	1	1.8	0.801ns
Epilepsy	7	12.3	0	0.0	
Hypertension	0	0.0	20	35.1	
DM	0	0.0	16	28.1	
CKD	0	0.0	4	7.0	
CVD	0	0.0	3	5.3	
Malignancy	0	0.0	1	1.8	

In terms of co-morbidities, in child group, epilepsy was present in 12.3% cases and other comorbidities were bronchial asthma (8.8%). Different comorbidities were present in adult group. Most common were hypertension (35.1%) Diabetes mellitus (28.1%) and chronic kidney disease (7.0%) (Table-V)

The study showed that 17.5% child got COVID-19 infection while being admitted to hospital due to other illness and another 22.8% child got admitted with their affected parents/family members. According to guideline only 59.6% children actually needed hospitalization, whereas it was 94.7% in adult group ($p < 0.05$). (Table-VI)

Table-VI					
Comparison of the study groups by hospital admission status (n=114)					
Hospital status	Child (n=57)		Adult (n=57)		p value
	N	%	N	%	
Previously admitted (due to other disease)	10	17.5	0	0.0	0.001s
Admitted with affected family members	13	22.8	3	5.3	
New admission (due to Covid 19 infection)	34	59.6	54	94.7	

Discussion

In this study the mean age was 8.48 ± 5.24 years in child group with female predominance (61.4%). In a study, Wenjun Du et al¹¹ reported that among 14 children, a median age of 6.2 years (range 0–16 years), and 6 cases (42.9%) were males which is comparable to our study. In another study, Wu et al observed that there was no significant difference in gender and the male-to-female ratio of all children was close to 1:1.

In the adult group the mean age was 57.33 ± 15.3 years with ranged from 25 to 88 years with a male predominance (73.7%). In a similar study, Wu et al¹² reported that the age of the adult patients was mainly between 19 and 49-years (67.6%) and the median age of adult patients was 47.0 (IQR, 33.0–66.0) years and there were 51.5% female patients. However, they also

reported that there was no difference in sex was found between pediatric and adult patients ($P = 0.451$).

Authors reported that the median age ranged from 28 to 70.^{13,14} both studies were conducted in North America. In Asia, median age varied from 33 years to 60 years,^{15,16} and 42 years in the European multicentre study.¹⁷ There was a balance on gender distribution, with the male gender proportion ranging from 44% to 55%^{13,18} in North American studies, 26% to 77%^{19,20} in Asian studies and 55% in the European study.¹⁷

Feng F et al²¹ reported that children are a very special group, largely due to close family contacts, and may be susceptible to cross infection. According to existing epidemiological data, 56% (34/61) of children with COVID19 demonstrated clear

evidence of transmission through family gatherings. In the current study it was 75.4%.

In this study, the mean duration of illness was less (9.1 ± 8.6 days) in child group than in adult group (14.8 ± 9.5 days.) The difference was statistically significant ($p < 0.05$) between two groups. 40.3% child got COVID-19 during hospital stay, whereas in adult group was 94.7% patient needed hospitalization due to COVID-19 infection. The difference was statistically significant ($p < 0.05$) between two groups. Heng Sim BL²² stated that a significant number of cases (62.7%) had a history of contact with known COVID-19 cases within the past 14 days of diagnosis and/or symptoms onset.

Although paediatric patients are susceptible to COVID-19, the case fatality rate of severe paediatric patients is much lower than that of adults (49.0%), which indicates that they have favourable outcomes compared with adults.^{23,24} Paediatric patients mostly recover in 1 to 3 weeks and are generally discharged after consecutive negative nucleic acid tests.^{23,25} It is noteworthy that the presentation of COVID-19 in paediatric patients is much milder than that in adults. Therefore, children may be a hidden source of infection.²⁶ Another difference was observed between the median duration of fever in children (1 day; range, 0-3 days) and adults (4 days; range, 1-10 days).

In this study, 10 (17.5%) children didn't had any symptom in this illness but in adult it was only 3(5.3%) person and the difference was statistically significant ($p < 0.05$). In a similar study, Wenjun Du et al¹¹ reported that most cases in children were mild (21.4%) and conventional cases (78.6%), with mild clinical signs and symptoms, and all cases were of family clusters. Fever (35.7%) and dry cough (21.4%) were described as clinical manifestations in children cases.

In this study, most common symptoms in child group was cough (77.2%) and Fever (71.9%) and runny nose (52.6%) whereas in adult group most common symptoms were Fatigue, excessive tiredness or lethargy (80.7%), cough (77.2%) and anosmia (70.3%).

Authors reported that polypnoea has been reported as the most common symptom in severely affected patients, followed by fever and cough.²⁷ Other reported symptoms were fatigue, myalgia, headache, and upper respiratory tract symptoms such as sore throat, nasal discharge, tachypnoea, and expectoration.²⁷

Olivia V Swann et al²⁸ reported that the most common presenting symptoms were fever (70%; 431/617), cough (39%; 233/599), nausea/vomiting (32%; 179/564), and shortness of breath (30%; 173/570) and the most common symptom is dyspnea, which is often accompanied by hypoxemia. Patients with severe disease typically require supplemental oxygen and should be monitored closely for worsening respiratory status because some patients may progress to acute

respiratory distress syndrome (ARDS).

It was observed that the mean heart rate/pulse and respiratory rate was higher in child group than adult, but that was within physiological limit for age group. Majority (98.2%) subjects were normal BP in child group and 26(45.6%) in adult group. Highest recorded temperature were less ($< 101^{\circ}\text{F}$) in the majority (86.0%) subjects of the child group than in the adult group (50.9%). Without additional oxygen, the mean SPO₂ remain higher ($96.8 \pm 1.2\%$) in child group than in adult group ($92.8 \pm 5.7\%$). The difference of BP, temperature, SPO₂ without oxygen, SPO₂ with oxygen, were statistically significant ($p < 0.05$) between two groups. Mannan N, Akram A²⁹ reported that dyspnea, respiratory frequency $\geq 30/\text{min}$, blood oxygen saturation (SpO₂) $\leq 93\%$, PaO₂/FiO₂ ratio < 300 , and/or lung infiltrates $> 50\%$ within 24 to 48 hours; (in 14% of cases).

In this study many adults had been suffering from different comorbidities. Common comorbidities were hypertension, diabetes mellitus, chronic Kidney disease, In a study, Heng Sim BL²² reported that about 25% of admitted cases had at least one comorbidity, and 1053 (20.0%) had history of medication for chronic diseases. Hypertension was the most common comorbidity (931, 15.8%) followed by diabetes mellitus (578, 9.8%) and asthma (196, 3.3%). About 496 (9.2%) active smokers had mild disease, while 33 (7.0%) had severe COVID-19 disease. Pediatric patients had fewer underlying diseases and complications than adults and compared with adults, children with COVID-19 had fewer comorbid conditions. Mannan N, Akram A²⁹ reported that approximately half (49.0%) of the critical patients and affected by preexisting comorbidities such as cardiovascular disease, diabetes, chronic respiratory disease, and oncological diseases, died While no fatal cases were seen in 1.0% of patients aged 9 years or younger age group.

What also remains uncertain is the risk of severe infection for children with significant underlying health concerns, including those with chronic kidney disease (CKD). The few studies reported have so far shown reassuringly low numbers and complication rates in children with coexisting diseases such as cancer and liver transplant recipients.^{30,31}

Conclusion

COVID-19 in children has distinct features of epidemiology and clinical manifestations. The clinical symptoms of children are mild, but that there is less clinical disease, perhaps because of a less pronounced inflammatory response, and that the occurrence of this pattern appears to inversely correlate with age. The findings from this study might help to formulate strategies and guidelines for prevention and treatment of pediatric COVID-19. There were some limitations. Sample size of our study was relatively small. Study subjects were

selected only from different hospital Dhaka city. More randomized clinical trials with larger patient cohorts are still essential to Compare of Clinical Characteristics of COVID-19 in Children and Adult

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