

Clinical Characteristics of COVID-19 Among Hospitalized Children in Bangladesh: A Multi-Center Study

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Received: 10 Dec 2020

Accepted: 31 Dec 2020

Published: 06 Jan 2021

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Citation:

Hussain M (2021) Clinical Characteristics of COVID-19 Among Hospitalized Children in Bangladesh: A Multi-Center Study. Korean Journal of Clinical Medicine. V1(2): 1-5.

Keywords:

Clinical characteristics; COVID-19; Children

1. Abstract

1.1. Background: Initially few cases of COVID19 in children being reported but the number of infected children identification is increasing day by day. In Bangladesh 3% of children <10 years were identified as COVID-19. Though over 90% of the cases were mild or moderate in nature but many of them required hospital admission.

1.2. Objective: To observe the Clinical characteristics of COVID-19 among hospitalized children in Bangladesh.

1.3. Methods: This retrospective multicenter study was conducted from May 2020 to November 2020 in Dhaka Shishu (Children) Hospital (DSH), Dhaka Medical College Hospital (DMCH), Mugda Medical College Hospital (MMCH) and Kurmitola General Hospital (KGH). Data were collected from hospital records. Clinical characteristics laboratory tests and radiography findings of COVID-19 infected children were noted. Data were analyzed

by using SPSS version 22.

1.4. Results: Among 553 COVID-19 hospital admitted cases male were 58.77% and male female ratio was 1.43:1. Children of all ages were affected and 30.74% were <1 year of age, 25.68% were 1-5 year belong to age group, 21.34% belongs to 6-10 years and 22.24% belongs to 11-15 years' age group. Among COVID-19 children 41.41% admitted with mild to moderate symptoms, 33.98% with severe symptoms and 20.61% with critical symptoms. Regarding clinical characteristics majority of the children admitted with fever (94.92%), cough (79.69%), dyspnea (59.77%) and desaturation (62.11%). Regarding investigation findings leukopenia was present in 41.02%, lymphopenia in 41.79%, raised CRP in 28.91%, ground glass opacity in chest X-ray in 3.52%, local patchy shadow in 46.88% and bilateral patchy shadow in 28.52% cases. Overall mortality was 4.52%.

1.5. Conclusion: This study found that large number of hospital-

ized children with COVID-19 presented with severe and critical symptoms. Majority of the children admitted with fever, cough, dyspnea and desaturation. Leukopenia, lymphopenia, raised CRP, localized patchy shadow and bilateral patchy shadow in CXR were also common. Mortality was 4.52% among hospitalized children with COVID-19.

2. Introduction

At initial stage while the global coronavirus crisis worsens, a surprising feature of the disease appeared that children might be immune from the worst of it and COVID-19 is more likely to infect older, particularly those with chronic comorbidities [1]. At present, pediatric patients have been reported all over the world, mainly asymptomatic and mild infections. With the progress of the epidemic and the innovation of detection technology, it was not ruled out that pediatric patients were particularly severe, and the number of critically infected children had increased and died. There is only limited data detailing the effects of COVID-19 on the pediatric population. A review of 72,314 cases by the Chinese Center for Disease Control and Prevention showed that <1% of COVID-19 cases were in children younger than 10 years [2]. In Bangladesh, it is difficult to estimate the infection with COVID-19 in pediatric patients due to low testing, home containment and fear of going with their child to the test center. The latest study indicates that about 7-8 % are infected in the pediatric age group with mortality rate of about 0.5-1% [3]. But infection in children was found rare among hospitalized COVID-19 patients in Bangladesh (4% below 15 years) [4].

Children of all ages can get COVID-19 [5-7]. Although severe cases of COVID-19 in children, including fatal cases, have been reported, most children appear to have asymptomatic, mild, or moderate disease and recover within one to two weeks of disease onset [8]. Raba et al [9] in a systematic review found the typical clinical manifestations were fever (54%) and cough (33%). Infants and newborns showed higher vulnerability to more acute COVID-19 disease compared to older children, however, both morbidity and mortality were low. Adigun et al [10] in UK found majority of patients under 18 years old experienced a mild disease and less than 1% of them died.

A systematic review by Ludvigsson et al [11] found that there appears to be no difference between children and adults concerning disease manifestations such as the usual fever and respiratory symptoms but significantly different from adults, rarely do children develop severe pneumonia. Furthermore, children appeared to be less affected by heightened inflammatory markers than adults, while lymphocytopenia was found to be very uncommon among children. Castagnoli et al [12] in yet another Systematic Review involved 1,065 participants (444 below 10 years of age, and 553 aged 10 to 19 years) found that children of all ages generally exhibited mild respiratory manifestations, mostly fever, dry

cough, and fatigue, or did not exhibit any symptoms. Bronchial thickening and ground-glass opacities were the major radiologic features.

As COVID-19 is a new disease with a dearth of literature in the pediatric population, our study sheds light by providing additional data from hospitalized children.

3. Materials and Methods

This retrospective multicenter study was conducted from May 2020 to November 2020 in Dhaka Shishu (Children) Hospital (DSH), Dhaka Medical College Hospital (DMCH), Mugda Medical College Hospital (MMCH) and Kurmitola General Hospital (KGH). Data were collected from hospital records. Clinical characteristics laboratory tests and radiography findings of COVID-19 infected children were noted. Data were analyzed by using SPSS version 22.

4. Results

Among 553 COVID-19 hospital admitted cases male were 58.77% and male female ratio was 1.43:1. Children of all ages were affected and 30.74% were <1 year of age, 25.68% were 1-5 year belong to age group, 21.34% belongs to 6-10 years and 22.24% belongs to 11-15 years' age group (Table-I).

Among COVID-19 children 41.41% admitted with mild to moderate symptoms, 33.98% admitted with severe symptoms and 20.61% admitted with critical symptoms. Mortality was 4.52% (Table-II).

Regarding clinical characteristics majority of the children admitted with fever (94.92%), cough (79.69%), dyspnea (59.77%) and desaturation (62.11%). Runny nose was present in 50.78% cases, feeding problem in 42.97%, vomiting in 14.45%, abdominal pain in 9.77%, diarrhea in 17.19%, myalgia 52.73%, headache in 40.63%, rash in 1.56%, red eyes in 0.78% and convulsion or unconsciousness in 4.69% cases (Table-III).

Regarding investigation findings leukopenia was present in 41.02%, lymphopenia in 41.79%, raised CRP in 28.91%, insignificant chest X-ray findings in 8.2%, ground glass opacity in 3.52%, local patchy shadow in 46.88% and bilateral patchy shadow in 28.52% cases (Table-IV).

5. Discussion

In this study, we found that children of all ages were affected with male predominance. Though children are reported to have milder disease, but our findings suggest that a subset of pediatric patients develop severe disease including MIS-C. The most common presenting symptoms were fever (94.92%), cough (79.69%), dyspnea (59.77%) and desaturation (62.11%). Leukopenia was present in 41.02%, lymphopenia in 41.79%, raised CRP in 28.91%, local patchy shadow in CXR in 46.88% and bilateral patchy shadow in 28.52% cases. Mortality was 4.52%.

Table 1: Distribution of age and gender of admitted Children with COVID-19 in DSH, DMCH, MMC and KGH (N=553)

Age and gender		DSH n=297	DMCH n=163	MMC n=46	KGH n=47	Total n(%)
Age in year	<1	129*	29	10	2	170(30.74)
	1-5	83	46	06	7	142(25.68)
	6-10	57	35	12	14	118(21.34)
	11-15	28	53	18	24	123(22.24)
Sex	Male	176	99	26	24	325(58.77)
	Female	121	64	20	23	228(41.23)
	Ratio	1.45:1	1.54:1	1.3:1	1.04:1	1.43:1
Total		297	163	46	47	553

*Among 129 children below 1 year from Dhaka Shishu (Children) Hospital 43 were neonate.

Table 2: Severity of illness and outcome of admitted Children with COVID-19 in DSH, DMCH, MMC and KGH (N=553)

		DSH n=297	DMCH n=163	MMC n=46	KGH n=47	Total n(%)
Severity of illness	Mild/Moderate	120	64	21	24	229(41.41)
	Severe	110	63	18	19	210(33.98)
	Critical	67*	36	7	4	114(20.61)
Outcome	Survived	284	154	45	45	528(95.48)
	Died	13	9	1	2	25(4.52)

*Among 67 critical children from Dhaka Shishu (Children) Hospital 8 were diagnosed as MIS-C.

Table 3: Clinical characteristics of admitted Children with COVID-19 in DMCH, MMC and KGH (N=256)

Clinical Manifestations	DMC	MMC	KGH	Total n(%)
Fever	153	45	45	243(94.92)
Nasal Congestion/ Running nose	122	5	3	130(50.78)
Cough	122	41	41	204(79.69)
Dyspnea	112	20	21	153(59.77)
Oxygen saturation <92% during period of hospitalization	110	26	23	159(62.11)
Feeding Problem and vomiting	44	34	32	110(42.97)
Vomiting	14	12	11	37(14.45)
Abdominal pain	10	8	7	25(9.77)
Diarrhea	37	4	3	44(17.19)
Myalgia	115	12	8	135(52.73)
Headache	98	4	2	104(40.63)
Rash	0	3	1	4(1.56)
Red eyes/Conjunctivitis	0	2	0	2(0.78)
Convulsion, Unconsciousness	10	2	0	12(4.69)

Table 4: Investigation findings of admitted Children with COVID-19 in DMCH, MMC and KGH (N=256)

Investigations	DMC	MMC	KGH	Total n(%)	
CBC	Leukopenia	83	10	12	105(41.02)
	Lymphopenia	51	27	29	107(41.79)
CRP	Raised CRP	28	21	25	74(28.91)
CXR	Nothing significant	-	10	11	21(8.20)
	Ground-glass opacity	5	2	2	9(3.52)
	Local patchy shadowing	78	19	23	120(46.88)
	Bilateral patchy shadowing	52	12	9	73(28.52)
	Interstitial abnormalities	28	3	2	33(12.89)

In a multicenter cohort of 582 European children <18 years of age with laboratory-confirmed COVID-19 during April 2020 (the early peak of the European pandemic), the age distribution was <1 year - 29%, 1 to 5 years - 21%, 5 to 10 years - 16%, >10 years - 34% percent. Göttinger et al [13] found <1 year - 29%, 1 to 5 years - 21%, 5 to 10 years - 16%, >10 years - 34%. Early in the pandemic in the United States, infants <12 months also accounted for a large

proportion of pediatric cases (15 percent) [7]. This study found Children of all ages were affected and 30.74% were <1 year of age, 25.68% were 1-5 year belong to age group, 21.34% belongs to 6-10 years and 22.24% belongs to 11-15 years' age group.

In a systematic review of 7480 children <18 years of age with laboratory-confirmed COVID-19 infection, where information about symptoms and severity was available for 1475. Among these, 15

percent of cases were asymptomatic, 42 percent were mild, 39 percent were moderate, 2 percent were severe and 0.7 percent were critical. There were six deaths in the entire study population (0.08 percent) [14]. De Souza et al [15] found 15% were asymptomatic, 36.3% were mild, 46.0% were moderate, 2.1% were severe, and 1.2% were found critical in another study [15]. In this study 41.41% admitted with mild to moderate symptoms, 33.98% with severe symptoms and 20.61% with critical symptoms. Findings of this study suggest that a subset of pediatric patients developed severe disease with higher mortality. In a retrospective large cohort study of children with COVID-19 in China found 45% of the patients had moderate, severe, or critical symptoms such as pneumonia, hypoxia, or acute respiratory distress syndrome. In addition, the proportion of severe and critical patients among the infants (11%) was higher than that among other age groups [6].

Although the clinical findings in children with COVID-19 are diverse, fever or chills and cough are the most common reported symptoms [16]. The clinical findings overlap with those of multiple other clinical syndromes (eg, pneumonia, bronchiolitis or gastroenteritis). In this study regarding clinical characteristics majority of the children admitted with fever (94.92%), cough (79.69%), dyspnea (59.77%) and desaturation (62.11%). They also presented with runny nose was present in, feeding problem, vomiting, abdominal pain, diarrhea, myalgia, headache, rash, red eyes and convulsion or unconsciousness. Ghosh et al in a Bangladeshi study found that all patients presented with a combination of symptoms including fever, abdominal pain, diarrhea, and vomiting [17]. Yasuhara et al [18] found fever and cough, followed by upper respiratory symptoms such as rhinorrhea and a sore throat as common presentation. They also found proportion of the patients with dyspnea was lower than the proportion previously reported among adults and infants with COVID-19 developed more serious condition than that in older children [18].

In case surveillance in the United States (through May 30, 2020), information about symptoms was available for 5188 children age 0 through 9 years and 12,689 children age 10 through 19 years [19]. Among children age 0 through 9 years, the frequency of fever was 46%, cough 37% and shortness of breath 7%, myalgia 10%, rhinorrhea 7%, sore throat 13%, headache 15%, nausea/vomiting 10%, abdominal pain 7 percent, diarrhea 14%, loss of smell or taste 1%. Among children age 10 through 19 years, the frequency of fever was 35%, cough 41% and shortness of breath 16%, myalgia 30%, rhinorrhea 8%, sore throat 29%, headache 42%, nausea/vomiting 10%, abdominal pain 8 percent, diarrhea 14%, loss of smell or taste 10%. Gastrointestinal symptoms may occur without respiratory symptoms. Diarrhea, vomiting, and abdominal pain are the most common gastrointestinal symptoms reported in children [20]. Cutaneous findings have been reported infrequently and are not well characterized; they include maculopapular, urticarial, and

vesicular eruptions and transient livedo reticularis [21]. In this study runny nose was present in 50.78% cases, feeding problem in 42.97%, vomiting in 14.45%, abdominal pain in 9.77%, diarrhea in 17.19%, myalgia 52.73%, headache in 40.63%, rash in 1.56%, red eyes in 0.78% and convulsion or unconsciousness in 4.69% cases.

The main radiological features in pediatric patients with COVID-19 have been reported to be sub pleural ground-glass opacities and consolidations with surrounding halo signs, suggestive of pneumonia [20, 22]. Yasuhara et al [18] found that 54% of the pediatric patients had ground-glass opacities, and most of them had mild symptoms or were without any symptoms. Moreover, 83% of the infants who underwent chest CT had abnormal radiological findings, and the prevalence of pneumonia in infants was higher than that in the other age groups. ARDS is reported in 3%-5.8% of all patients with COVID-19 [23]. In this present study, we found insignificant chest X-ray findings in 8.2%, ground glass opacity in 3.52%, local patchy shadow in 46.88% and bilateral patchy shadow in 28.52% cases. No CT chest was done in this study.

In this study leukopenia was present in 41.02%, lymphopenia in 41.79%, raised CRP in 28.91% cases. Qiu et al found lymphopenia (31%), leucopenia (19%), and elevated creatine kinase-MB (31%) and procalcitonin (17%) levels in the cohort of pediatric patients with COVID-19. Xia W et al [20] showed the laboratory findings in pediatric patients with COVID-19, including lymphopenia (35%) and elevated ALT (25%), creatine kinase-MB (75%), CRP (45%), and procalcitonin (80%) levels. Although data regarding the coagulation profile in children with COVID-19 has not been sufficient to date, the study of adult patients with COVID-19 demonstrated that the prothrombin time and D-dimer levels were higher in ICU patients than non-ICU patients [3]. In addition, Zhou et al reported that an elevated D-dimer level was 1 of the important risk factors of death in adult patients after COVID-19. No D-dimer was done in this study [25]. Recent observations raised concern about a new MIS-C related to SARS-CoV-2 infection, known as MIS-C. MIS-C shares similarities with KD but has some distinct features such as the epidemiology, age of onset affecting older children and adolescents, gastrointestinal symptoms, shock, cardiac dysfunction, acute heart failure, and extremely high levels of inflammatory biomarkers and brain natriuretic peptide [26]. In this study clinical presentations of these patients were fever, rash, conjunctivitis, and peripheral edema with significant gastrointestinal symptoms. All the patients developed shock, managed in ICU. This study was a retrospective study included small number of pediatric patients and were not able to assess more detailed clinical information, inflammatory marker and treatment. Further studies with large cohorts of pediatric patients are needed to gain a better understanding of the severity, risk factors, outcomes, and management of children with COVID-19.

6. Conclusion

Though children are reported to have milder disease, but our findings suggest that a subset of pediatric patients developed severe disease including MIS-C. Majority of the children admitted with fever, cough, dyspnea and desaturation. Leukopenia, lymphopenia, raised CRP, local patchy shadow and bilateral patchy shadow in CXR are common in children. Mortality was 4.52%.

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