

Clinical Presentations of Covid-19 Infection in Pediatrics and Assessment of Cardiac Affection by Echocardiograph

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Abstract

Background: A series of published articles have reported the epidemiological and clinical characteristics of the hospitalized patients with COVID-19. Most patients reported in the literature were adults, and commonly presented with pneumonia and abnormal findings on chest CT. Elderly patients with comorbidities were more likely to exacerbate with severe and even fatal respiratory diseases such as acute respiratory distress syndrome (ARDS). The number of reported pediatric patients is limited and the clinical characteristics of pediatric COVID-19 was rarely reported. AIM: Studying of the clinical presentation of all pediatric patients admitted with clinical features suggestive or confirmed of Covid-19 infection during hospital stay. METHODOLOGY: This is a cross sectional study, which included all the admitted patients meeting the inclusion criteria of suspected or confirmed COVID-19 infection admitted at Benha Fever Hospital during the period of study which will be 6 months. RESULTS: PICU Admission due to System Failure in 30%, mortality rate was 8.3%. Higher TLC, CRP, ferritin were associated with PICU Admission due to System Failure. Non survivors were significantly associated with higher TLC, ALC, CRP and lower oxygen saturation. Conclusion: COVID-19 might influence all body systems causing various clinical presentations varying from mild to life-threatening conditions.

Keywords: covid 19, SARS, pediatric infection.

1. Introduction

Since December 2019, COVID-19 has occurred unexpectedly and emerged as a health problem worldwide and WHO had declared it as a pandemic due to the large number of cases and easy transmission across many countries simultaneously. The first cases of coronavirus disease 2019 (COVID-19) was reported in Wuhan, China, with rapid spread worldwide, and COVID-19 became a public health emergency of international concern [1]. The Coronavirus (CoV) are positive-sense single-strand RNA viruses with around 24 similar species from the family of coronaviridae. alpha (α) and beta (β) coronavirus genera are pathogenic to mammalian and humans. [1]. Human coronaviruses such as 229E and NL63 are responsible for common cold and croup and belong to α coronavirus. In contrast, SARS-CoV, Middle East respiratory syndrome coronavirus (MERS-CoV) and SARS-CoV-2 are classified to β coronaviruses. [2]. A vast population has been affected by respiratory disease due to these two Coronavirus outbreaks [3]. Although the pathogenesis behind COVID-19 is not well understood, the pathogenesis of MERS-CoV and SARS-CoV still can be the best source of information regarding COVID-19 [4]. SARS-CoV-2 may spread from person to person by droplets from respiratory secretions. The incubation period of SARS-CoV-2 infection ranges from 1 to 14 days, mostly ranging from 3 to 7 days [5]. Children account for a relatively small proportion of laboratory confirmed SARS-CoV-2 infections, usually has a relatively mild course, which may be responsible for a lower number of diagnostic test [6].

The most common clinical symptoms in the group of outpatients included dysgeusia and

anosmia, and headache. In children from the hospitalized group, febrile illness is the most common symptom with signs of respiratory tract involvement. It is now well known that respiratory system is the most common system involved in covid-19 infection and the lung is the most affected organ most common signs and symptoms were cough, pharyngeal erythema, and fever [7]. Slightly smaller number of children had an oxygen saturation of < 92% during their hospitalization. Also, anosmia, dysgeusia, rhinorrhea, fatigue, body aches and nasal congestion were widely reported [8]. Gastrointestinal manifestations often accompany the initial presentation with fever. These commonly include abdominal pain, diarrhea, and/or vomiting. symptoms and signs of dehydration [9]. Also a portion of patients presented by few systemic manifestations as: Fever, headache, myalgia, chills and lethargy [10]. Asymptomatic papulovesicular exanthemata's rash has been reported in patients with COVID-19. Most of cases resolved spontaneously without treatment in a week [11].

Regarding laboratory investigations, Lymphopenia was present on admission in majority of patients, some were in the severe range. Radiologically, chest radiographs shows bilateral ground glass opacities which were basal, peripheral and sub-pleural. Peri-bronchial and parahilar thickening were also found in most of patients. Computerized Tomography (CT chest) scan was the most frequently used imaging modality. Unilateral lung involvement was frequent when compared with bilateral and ground-glass opacities were the most frequent definitive radiological findings. Other common radiological findings were non-specific patchy shadows, consolidation, halo

sign, pulmonary nodules and prominent broncho vascular marking. Interstitial infiltration being the most frequent lung ultrasound finding [14].

2. Subjects and Methods

This study will include all the admitted patients meeting the inclusion criteria of suspected or confirmed COVID-19 infection admitted at Benha Fever Hospital during the period of study which will be 6 months. All pediatric patients with clinical features of suspected or confirmed COVID-19 infection of the age group 1-14 years old were included into the current study. While patients with chronic diseases such as: chronic kidney disease, chronic neurological insult, or chronic lung disease were excluded. Taking full history from the patient's relatives. All patients were subjected to general assessment especially temperature, respiratory rate and O₂ saturation, and local examination especially chest and cardiac examination. Patients will be classified according to O₂ saturation at room air into mild cases with O₂ saturation at room air 95% or greater, moderate cases with O₂ saturation at room air 85-95%, severe cases with O₂ saturation at room air less than 85%. Investigations were done such as pulse oximetry to detect O₂ saturation on room air, CBC, CRP, Chest X-ray.

3. Statistical Analysis

The collected data was revised, coded, tabulated using Statistical package for Social Science (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 225.0. Armonk, NY: IBM Corp.). Mann Whitney Test (U test) was used to assess the statistical significance of the difference of a non-parametric variable between two study groups. Student T Test was used to assess the statistical

significance of the difference between two study group means. Chi-Square test was used to examine the relationship between two qualitative variables. All reported p values were two-tailed and p < 0.05 was significant.

4. Results

The current study was conducted on 60 child who were diagnosed or suspected as having COVID-19 infection, they had a median age of 7 years (range 1-14). Males were 51.7% versus 48.3% of females. Mean weight was 26.9 g, mean height was 1 meter, and mean BMI was 23.6 kg/m². Among all studied cases, 54 (90%) patients were presented with fever, follow by dry cough in 31 (51.7%) children, dyspnea in 23 (38.3%) child, bony aches in 22 (36.7%) patients, and finally anosmia in 19 (31.7%) patients. (Table 1). GIT symptoms varied from diarrhea in 22 (36.7%) children, vomiting in 23 (38.3%) patients, abdominal Pain in 27 (45.0%) children, and abdominal Distension in 8 (13.3%) children (Table 1). Regarding neurological symptoms, headache was reported by 13 (21.7%) patients, Convulsions in 14 (23.3%) patients, DCL in 11 (18.3%) children, Psychic manifestations in only one patient and 2 patients with Abnormal gait (Table 1). Only 17 (28.3%) patients had cutaneous manifestations, while 11 (18.3%) children had conjunctivitis, 4 (6.7%) patients had renal disease and 14 had PIMS (23.3%).

Higher TLC, CRP, Serum ferritin, were associated with included of PICU Admission due to System Failure with p values 0.035, 0.001, 0.047, 0.035 and 0.001 respectively.

Non survivors were significantly associated with higher TLC, ALC, CRP LDH. In addition, oxygen saturation was significantly lower among non-survivor group.

Table (1) Features of the included children.

		Covid-19 cases n=60
Age (years)	median (min-max)	7 (3-14)
Male	N, %	31(51.7%)
Female	N, %	29(48.3%)
Weight (kg)	Mean(SD)	26.9(13.3)
Height (m)	Mean(SD)	1(0.3)
BMI (Kg/m ²)	Mean(SD)	23.6(4.8)

Table (2). Clinical features of the included children.

		Covid-19 cases n=60	
Constitutional symptoms	Fever	54(90%)	54(90%)
	Body Aches	22(36.7%)	22(36.7%)
Respiratory symptoms	Anosmia	19(31.7%)	19(31.7%)
	Dry Cough	31(51.7%)	31(51.7%)
	Dyspnea	23(38.3%)	23(38.3%)
Cardiac symptoms	Tachypnea	21(35%)	21(35%)
	Orthopnea	16(26.7%)	16(26.7%)
	Hypotension	10(16.7%)	10(16.7%)
GIT symptoms	Diarrhea	22(36.7%)	22(36.7%)
	Vomiting	23(38.3%)	23(38.3%)
	Abdominal Pain	27(45%)	27(45%)
	Abdominal Distension	8(13.3%)	8(13.3%)
Cutaneous	Jaundice	6(10%)	6(10%)
		17(28.3%)	17(28.3%)
Neurological symptoms	Headache	13(21.7%)	13(21.7%)
	Convulsions	14(23.3%)	14(23.3%)
	DCL	11(18.3%)	11(18.3%)
	Psychic	1(1.7%)	1(1.7%)
	Abnormal gait	2(3.3%)	2(3.3%)
Ophthalmological	Conjunctivitis	11(18.3%)	11(18.3%)
Renal	N, %		4(6.7%)

Table (3). Outcomes among the included children.

		Covid-19 cases n=60	
Cardiac dysfunction	N, %	10	16.7%
PICU Admission due to System Failure	N, %	18	30%
Mortality	Survivors	55	91.7%
	Non survivors	5	8.3%

Table (4). Comparison patient's features according to incidence of PICU Admission due to System Failure.

		PICU Admission due to System Failure		p value
		Absent n=42	Present n=18	
Age (years)	median (min-max)	7 (3-14)	4 (3-14)	0.150
Male	N (%)	22(52.4%)	9(50%)	0.861
Female	N (%)	20(47.6%)	9(50%)	
BMI (Kg/m2)	Mean (SD)	23.1(4.8)	26.06(4.2)	0.543
TLC (X10 ⁹ /L)	median (min-max)	10.5(3.1-56)	13.2(7.5-32)	0.035
ALC (X10 ⁹ /L)	median (min-max)	2.15(0.5-5.5)	2.25(0.8-8.4)	0.240
Lymphocytes (%)	median (min-max)	18.73 (6.9-35)	15.75 (8-42)	0.990
CRP	median (min-max)	12 (4-98)	48 (4-196)	0.001
Ferritin	median (min-max)	192(100-1221)	388(55-1200)	0.047
ALT	median (min-max)	34(18-855)	35(18-123)	0.942
AST	median (min-max)	35(18-288)	36(18-115)	0.791
Bilirubin	median (min-max)	1.07(0.56-7)	1.15(0.45-2.1)	0.573
ESR	median (min-max)	12(6-44)	21(9-120)	0.091
SPO2 on RA (%)	median (min-max)	95.50(65-99)	90.50(45-99)	0.073
Positive Cultures	N (%)	9(21.4%)	7(38.9%)	0.161
Survived	N (%)	42(100%)	13(72.2%)	<0.001
Not survived	N (%)	0(0%)	5(27.8%)	

Table (5) Comparison patient's features according to incidence of mortality.

		Mortality		p value
		Survivors n=55	Non survivors n=5	
Age (years)	median (min-max)	7(3-14)	4(3-10)	0.162
Male	N (%)	27(49.1%)	4(80%)	0.183
Female	N (%)	28(50.9%)	1(20%)	
BMI (Kg/m ²)	Mean (SD)	23.49(4.94)	24.82(3.61)	0.561
TLC (X10 ⁹ /L)	median (min-max)	10.9(3.1-56)	18.6(12.5-27)	0.021
ALC (X10 ⁹ /L)	median (min-max)	2(0.5-7.5)	3.4(1.5-8.4)	0.025
RLC (%)	median (min-max)	18(6.9-42)	24.8(12.1-33.8)	0.331
CRP (mg/L)	median (min-max)	18(4-119)	48(32-196)	0.007
Ferritin	median (min-max)	212(55-1221)	356(212-1200)	0.125
ALT (U/L)	median (min-max)	34(18-855)	35(29-121)	0.634
AST (U/L)	median (min-max)	35(18-288)	33(18-115)	0.950
Bilirubin (mg/dL)	median (min-max)	1.1(0.45-7)	1.3(1-1.7)	0.412
ESR (mm/h)	median (min-max)	14 (5-60)	17 (10-120)	0.460
SPO2 on RA	median (min-max)	96 (50-99)	75 (45-81)	0.001
Positive Cultures	N (%)	14(25.5%)	2(40%)	0.480

5. Discussion

The novel coronavirus pandemic, SARS-COV-2 (COVID19), has become a significant concern due to its high mortality rate and unknown nature [21]. This virus typically involves the respiratory tract, other organs are also involved with extra-pulmonary manifestations [22]. The clinical manifestations range from being asymptomatic or having mild respiratory symptoms to having severe life-threatening respiratory and heart failure [23]. The present study revealed that there was no statistically significant difference between studied groups according to incidence of PICU admission due to system failure in terms of demographic and anthropometric data which agreed with Esposito et al., 2021 that the criteria for admission to a PICU for the SARS-CoV-2-positive patient are not different from the general admission criteria for non-positive pediatric patients [24]. This was in same line with Uka et al., 2022 that found no relation between PICU admission and children's demographic data [25]. Our study found that higher total leucocytic count (TLC), c-reactive protein(CRP), Serum ferritin, and high mortality were significantly higher among patients who was associated with PICU admission due to system failure, which agreed with Abrams et al., 2021 [27]. And similar results were found in Kazi et al., 2022 the overall mortality rate was 7.6% among PICU admitted patients [28]. Our study revealed that common indications of intensive care unit were patients requiring mechanical ventilation, Shock requiring vasopressor support, Worsening mental status and multi-organ dysfunction syndrome. Which agreed with Fisler et al.,2020 that the most common causes of PICU admission were multi-system failure, hypoxia, and hemodynamic instability [30]. The present study found that total leucocytic count(TLC), C-reactive protein(CRP)

were significantly higher among expired group. Oxygen saturation, Absolute lymphocytic count (ALC) was significantly lower among non-survivor group.

Our study found no significant association was found regarding demographic and anthropometric data. While other report found that, there were significant differences in the anthropometric parameters measured and, in the results, obtained for Body Mass Index (BMI) and body fat percentage pre- and post-lockdown in both boys and girls, no significant differences were found in waist-circumference measurements [34].

A limitation of our study is that it was a single-center cross sectional observational study with a relatively small number of patients, evaluating short-term outcomes, and therefore has limited generalizability. The lack of prospective independent validation may be a limitation for the use of our sensitivity and specificity cutoff values for the general population. Additionally, cardiac MRI was not performed during hospitalization because of unstable clinical condition and risk for contamination of the MRI area, cardiac MRI in the future will be done to evaluate cardiac function in patients with persistently abnormal LVLS to discern long-term cardiac well-being. Investigations focusing on the long-term outcomes are needed for children with and without acquired and congenital heart disease who have had SARS-CoV-2 infection. The consequences of long COVID-19 and the impact of this disease on the heart have yet to be elucidated in children and young adults. So, the long-term cardiovascular manifestations of COVID-19 in children require continued clinical research trials.

In conclusion, COVID-19 might influence the cardiovascular system at various levels leading to myocardial ischemia, arrhythmia, heart failure,

myocarditis, and multisystem inflammatory syndrome in children. Children with PMIS due to COVID-19 can develop life-threatening cardiac decompensation.

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