

DOI: 10.36648/2254-609X.9.3.7

Pediatric COVID-19 Patients in Jeddah, Saudi Arabia: Clinical, Laboratory and Radiological Aspects

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Received date: June 15, 2020; Accepted date: June 17, 2020; Published date: June 29, 2020

Citation: Harbi SA, Kobeisy SAN, Mehdawi RS, Bashammakh DS, Mosalli RM (2020) Pediatric COVID-19 Patients in Jeddah, Saudi Arabia: Clinical, Laboratory and Radiological Aspects. J Biomedical Sci Vol.9 No.3:7.

Abstract

Objectives: The aim of this study is to describe the clinical manifestations along with the laboratory and radiographic findings in the local pediatric population in order to better understand the novel corona virus and its implications on the pediatric age group.

Method: The Pediatric Coronavirus in Saudi Arabia (PERSONA) study, a retrospective cohort, was conducted at Dr. Soliman Fakeeh Hospital in Jeddah, Saudi Arabia to analyse the clinical, laboratory and radiological findings of pediatric patients confirmed to have the novel coronavirus through PCR for COVID-19 taken via nasopharyngeal swabs from March 1, 2020 to May 13, 2020.

Result: Approximately 54% (13/24) were male and 46% (11/24) were female. Patients ages ranged from 13 days to 17 years with an average of about 8.4 years and a standard deviation of 5.87 years. Leucopenia was present in 4/22 patients, while 75% had normal white blood cell counts. Neutropenia was evident in 25% (6/22) of patients while 83.3% (20/22) of patients exhibited normal lymphocyte counts. Eosinopenia was the striking finding in 75% (18/22) of those in the study while only four (16.7%) of the COVID-19 patients showed normal eosinophil counts.

Conclusion: Eosinopenia may be a sign of less severe infection in children and therefore should be further studied. More research is needed in the region to better understand the implications of the novel corona virus and whether disease course and burden differs across nations and from adults to pediatrics.

What's Known on this Subject: The novel corona virus first emerged in Wuhan in December 2019. This virus is spread by respiratory droplets and initially infects the respiratory system. Most studies done to present day have been on the effect of the virus in adults.

What this Study Adds: This study explores the effect of COVID-19 on children in Saudi Arabia and whether their clinical, laboratory and radiological features are similar to children in China. This study will help to better understand the disease course in this age group.

Keywords: Absolute neutrophil count; Polymerase chain reaction; Computerized tomography; White blood cell; COVID-19; Pediatric population

Abbreviations: PERSONA Study: Pediatric Coronavirus in Saudi Arabia Study; DSFH: Dr. Soliman Fakeeh Hospital; IRB: Institutional Review Board; WBC: White Blood Cell; ANC: Absolute Neutrophil Count; CRP: C-Reactive Protein; PCR: Polymerase Chain Reaction; No.: Number; CT: Computerized Tomography; MOH: Ministry of Health; ICU: Intensive Care Unit; ACE2: Angiotensin Converting Enzyme 2

Introduction

SARS-CoV-2, an extremely infectious corona virus causing COVID-19 by transmission of respiratory droplets, was first registered in Wuhan, China in December 2019 [1]. The worldwide pandemic that shortly ensued seemed to affect adults more so than children. Although pediatric age groups are less likely to become severely ill when infected with the novel corona virus, it has been suggested that younger children specifically those who have underlying pulmonary conditions and those who are immunocompromised may suffer a more rigorous disease course [2]. The clinical presentation of COVID-19 is extensive, and can range from asymptomatic disposition to severe respiratory distress and shock requiring invasive respiratory support in an intensive care setting [3].

Most reported patients in the literature on the novel coronavirus are adults whereas studies regarding the disease in pediatrics are limited [4]. Common presenting symptoms in children are fever and dry cough while abnormal lab markers include leucopenia and lymphocytopenia [5]. Radiological

findings of corona virus related pneumonia in pediatrics on chest CT have been reported as ground glass appearance or consolidation with a surrounding halo [6]. One study comparing affected children and their families found all children who were positive had contact with other positive household members and though the children had later onset of symptoms than their families, they remained positive for the virus for longer periods of time [7]. A considerable amount of observations in the current literature have been based on Chinese studies and it is conceivable that there are regional differences in disease course among different populations [8].

As of May 20, 2020, according to the Saudi Ministry of Health (MOH), 62,545 cases of the novel corona virus had been reported in Saudi Arabia. Local data regarding SARS-CoV-2 in general is deficient, specifically in the pediatric population. The aim of this study is to describe the clinical manifestations along with the laboratory and radiographic findings in the local pediatric population in order to better understand the novel corona virus and its implications on the pediatric age group.

Methods

The Pediatric Coronavirus in Saudi Arabia (PERSONA) study, a retrospective cohort, was conducted at Dr. Soliman Fakeeh Hospital in Jeddah, Saudi Arabia to analyse the clinical, laboratory and radiological findings of pediatric patients confirmed to have the novel coronavirus through PCR for COVID-19 taken via nasopharyngeal swabs from March 1, 2020 to May 13, 2020.

Collection of medical records for analysis was approved by the Dr. Soliman Fakeeh Hospital Institutional Review Board (DSFH IRB). A total of 191 pediatric patients were swabbed based on the Saudi Ministry of Health COVID-19 Protocol. Patient files were reviewed on the hospital information system, YASASII, to extract initial vital signs, laboratory and radiological findings and presenting signs and symptoms. Parameters that were included are: axillary body temperature, pulse oxygen saturation, respiratory rate, White Blood Cell count (WBC), Absolute Neutrophil Count (ANC), lymphocyte, eosinophil and platelet counts, C- Reactive Protein (CRP), chest X- ray findings, chest CT, need for ICU and mechanical ventilation, length of stay, age and sex. Data was collected and analyzed using IBM SPSS Statistics Version 20.

Results

Of the 191 patients less than 18 years, 24 were positive for the novel corona virus. Approximately 54% (13/24) were male and 46% (11/24) were female. Patients ages ranged from 13 days to 17 years with an average of about 8.4 years and a standard deviation of 5.87 years.

The most common presenting symptom in pediatrics was fever at 83.3% (20/24). 15/21 patients had documented contact with family members who were positive for COVID-19. Respiratory distress was only present in 50% of the patients on initial presentation. Runny nose, sore throat and cough were

present in less than half the patients at 33.3%, 16.7% and 8.3% respectively. Rash was not a presenting symptom in any of the patients.

The mean presenting temperature was 37.2°C and only 3 patients had documented fever on initial presentation. 8.3% (2/21) of patients had age related tachypnoea one of whom was febrile at the time of measurement. Also, one case presented with age related bradypnea while the rest of the patients had normal age-related respiratory rates. Mean pulse oxygen saturation was 97.8% with the lowest reading being 95%. **Table 1** summarizes the clinical findings of the patients included in the study.

Table 1: Clinical findings of pediatric patients*.

Characteristic	PERSONA Study N=24
Mean age (range)-year	8.4 (0-17)
Age distribution-no.** (%)	
<1 year	4 (17)
1 to <6 years	4 (17)
6-10 years	7 (29)
>10 years	9 (38)
Sex-no./total no. (%)	
Female	11/24 (46)
Male	13/24 (54)
Exposure to SARS Co-V-2-no./total no. (%)	15/21 (63)
Fever-no./total no. (%)	20/24 (83)
Temperature:	
<37.5	19/24 (79)
37.6-38	2/24 (8)
38.1-39	2/24 (8)
>39	1/24 (4)
Cough-no./total no. (%)	2/21 (8)
Respiratory Distress-no./total no. (%)	12/23 (50)
Runny nose-no./total no. (%)	8/21 (33)
Sore throat-no./total no. (%)	4/22 (17)
Rash-no./total no. (%)	0
Tachypnea-no./total no. (%)	2/21 (10)
SPO2 less than 92%-no./total no. (%)	0
Positive Contact-no./total no. (%)	15/21 (63)
Outcome:	
Admitted-no./total no. (%)	22/24 (92)
Survived-no./total no. (%)	24/24 (100)
Died-no./total no. (%)	0
Discharged home isolation-no./total no. (%)	16/22 (73)

Discharged external care facility isolation-no./total no. (%)	6/22 (27)
*Percentages may not equal 100% due to rounding	
**no.=number	

Leucopenia was present in 4/22 patients, while 75% had normal white blood cell counts. Neutropenia was evident in 25% (6/22) of patients while 83.3% (20/22) of patients

exhibited normal lymphocyte counts. Eosinopenia was the striking finding in 75% (18/22) of those in the study while only four (16.7%) of the COVID-19 patients showed normal eosinophil counts. Elevated CRP was considered as a level above 5 mg/L and was found in only 4/22 (16.7%) and was normal in 75%. Laboratory findings of the pediatric COVID-19 positive patients are displayed in **Table 2**.

Table 2: Laboratory parameters of pediatric COVID-19 patients.

PERSONA STUDY		WBC (10 ⁹ /μL)	ANC (10 ⁹ /μL)	Lymphocytes (10 ⁹ /μL)	Eosinophils (10 ⁹ /μL)	Platelets (10 ⁹ /μL)	CRP (mg/L)
N	Valid	22	22	22	22	22	22
	Missing	2	2	2	2	2	2
Mean		6.79	2.63	3.36	0.17	301	4.87
Standard Deviation		2.26	1.85	1.6	0.3	86	9.82
Minimum		2.75	0.29	1.27	0	192	0.13
Maximum		10.13	6.88	6.72	1.47	535	36.25

Chest x-ray results were normal in 10/23 (41.7%) patients, 11/23 (43.9%) had increased Broncho vascular markings, one patient was found to have right upper lobe pneumonia (4.2%) and one was found to have bilateral diffuse ground glass veiling with air bronchogram (4.2%). Only two patients required chest CT scans due to shortness of breath and were subsequently reported as normal. None of the patients were admitted to the ICU nor required mechanical ventilation.

The mean length of stay at the hospital was 5.63 days with a standard deviation of 4.05 days, a minimum of 0 days and a maximum of 13 days. All patients were discharged in good condition with 16 documented to complete two weeks of home isolation, six to continue isolation at an external care facility and two patient's files exhibited poor documentation.

Discussion

Perhaps this is the first retrospective study on the clinical characteristics as well laboratory and radiological features of pediatric COVID-19 patients in Saudi Arabia and possibly, in the Middle East.

The male to female ratio was approximately 1.2:1. The ages observed in the study ranged from as young as 13 days and up to 17 years, which suggests that males as well as females across all pediatric age groups are susceptible to contracting the novel corona virus.

Approximately 88% of the patients presenting to the hospital experienced respiratory distress, fever, runny nose, cough or sore throat. Roughly 71% of children had documented contact with other cases of confirmed COVID-19, however all the pediatric patients experienced a mild disease course and did not require ICU admission or mechanical ventilation and were all discharged in good health to complete isolation out of the hospital. Nearly 42% of patients had normal chest radiographs and only two required chest CT for

shortness of breath, with their scans exhibiting normal results. This reinforces that pediatric cases usually experience a milder disease course than adults affected with SARS-CoV-2. It has been suggested that children may be less susceptible to the novel corona virus due to their decreased expression of ACE2 which may be used as a receptor to bind SARS-CoV-2 [9,10].

Interestingly 75% of the patients were found to have eosinopenia, while 75% had normal white blood cell counts and around 83% had normal lymphocyte counts for age. This is contrary to other studies which found children to have lymphocytopenia and leucopenia [5]. To the best of our knowledge, there haven't been any studies on eosinophil levels in pediatric COVID-19 patients. More research is needed in this domain and this could possibly explain the milder disease course in pediatric patients affected with the novel corona virus.

Albeit, Jeddah is a port city and serves as one of the major entry points to Saudi Arabia, limitations of this study include the small sample size and the restriction to one tertiary care center. Small sample size may be due in part to only symptomatic patients being swabbed for the novel corona virus. Contrary to other studies, where testing of symptomatic as well as asymptomatic children yielded higher case results [2,10]. Likewise, exposure history and incubation periods were not studied.

Conclusion

Children of all age groups may be affected by SARS-CoV-2 and most likely will experience a mild disease course. Eosinopenia may be a sign of less severe infection in children and therefore should be further studied. Asymptomatic children may pose a great risk to the community especially since they may go undetected and may be a source of disease transmission. More research is needed in the region to better

understand the implications of the novel corona virus and whether disease course and burden differs across nations and from adults to pediatrics.

Funding

No funding was secured for this study.

Authors' Contributions

Dr. Saleh Al Harbi conceptualized and designed the study, reviewed and revised the manuscript, and critically reviewed and reviewed the manuscript for intellectual content.

Dr. Sumayyah Ahmed Nezar Kobeisy designed the data collection instruments, collected the data, carried out the data analysis and reviewed and revised the manuscript.

Dr. Raja Saleh Mehdawi conceptualized and designed the study, designed the data collection instruments, collected the data, and reviewed and revised the manuscript.

Dr. Rafat Mosalli conceptualized and designed the study, reviewed and critically reviewed and reviewed the manuscript for intellectual content.

All authors approve the final manuscript as submitted and agree to be accountable for all aspects of the work.

Conflict of Interest Disclosures (Includes Financial Disclosures)

The other authors have no conflicts of interest to disclose.

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