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Epidemiology and Clinical Profile of suspected Covid-19 paediatric patients admitted in First and Second wave in a Tertiary Care Centre of Western Maharashtra. A Comparative Study.

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Abstract:

Background: *Coronavirus disease-2019 (COVID-19) is a global health crisis. The clinical characteristics, disease progression and outcome in children and young adults appear significantly milder compared to older individuals. Many countries including India have witnessed a two-wave pattern in reported cases of coronavirus disease-19. Empirical data show that the characteristics of the effects of the virus do vary between the two periods. Many paediatric patients showed Covid like symptoms, but tested RTPCR (Real Time Polymerase Chain Reaction) negative for COVID-19 both in first as well as second wave. We selected this study as very few studies have been conducted comparing the epidemiology and clinical characteristic of suspect paediatric patient admitted in both wave.*

Material and Methods: *A prospective observational study of all hospitalized cases of SARS-CoV in 1st wave between April -June 2020 and 2nd wave between February- April 2021. All hospitalized suspected Covid-19 patient fulfilling the ICMR criteria for suspect with Covid-19 RTPCR negative was included. Thorough demographic, history of residence of hotspot area of Covid-19, history of contact with Covid positive patient, clinical history, and clinical examination was conducted for clinical data. Patient data included age, sex, pre-existing comorbid conditions. Statistical significance was set at p ≤0.05.*

Results: *The number of patients admitted was 121 in the 1st and 88 in 2nd wave.74 patients admitted on the basis of SARI in 1st wave, 37 patients (42.0%) in 2nd wave. 10 patients (8.3%) had a history of contact in 1st wave, 13 patients (14.3%) in 2nd wave. 83 patents (68.6%) resided in hotspot area in 1st wave, 64 patients (72.7%) in 2nd wave. Among the clinical characteristics, the most frequent sign and symptom in 1st wave was fever and difficulty in breathing, Cough/Cold. Patients from the second more frequently presented a higher frequency of gastrointestinal symptoms (loose stools, vomiting) and Seizures. The most relevant comorbidity in 1st wave was Thalassemia. There was no significant difference in the frequency of concomitant chronic diseases. Children with severe acute malnutrition were more in 2nd.*

Conclusion: *There was difference in the clinical characteristics and associated comorbid conditions in patients admitted in both wave. Majority of children admitted as per the testing criteria were found to be COVID negative.*

Key Words *: Covid-19, SARS-CoV-2, Epidemiology, ICMR, SARI*

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I. Introduction

Coronavirus disease-2019 (COVID-19) is a global health crisis. The 2019 novel severe acute respiratory syndrome coronavirus (SARS-CoV-2) is currently causing an outbreak of coronavirus disease 2019 (COVID-19), which is an emerging global threat that is rapidly spreading throughout the world [1, 2]. It has

caused high rates of mortality, predominantly in adults. Children are significantly less affected by SARS-CoV-2 with far lower rates of recorded infections in children compared to adults, milder symptoms in the majority of children and very low mortality rates. Data on SARS-CoV-2 infection in children are scarce [1, 2, 3]. Children seem to be less likely affected by the disease. Among over 72,000 COVID-19 cases from China, only 1.2% of the patients were children 10 to 19 years of age, and 0.9% were children under 10 years of age [4]. The clinical characteristics, disease progression and outcome in children and young adults appear significantly milder compared to older individuals [5].

Many countries including India have witnessed a two-wave pattern in reported cases of coronavirus disease-19 during the 2020 pandemic, with a first wave during spring followed by the current second wave in late summer and autumn [6-12]. Empirical data show that the characteristics of the effects of the virus do vary between the two periods[13]. Many paediatric patients showed Covid like symptoms, but tested RTPCR (Real Time Polymerase Chain Reaction) negative for COVID-19 both in first as well as second wave. Although the comparative characteristics of the two waves still remain largely unknown, the differences in the clinical symptoms and severity of the disease have been reported in the paediatric age group [14]. Therefore this study was conducted to investigate the epidemiology and clinical profile of hospitalized suspected COVID-19 paediatric patients using data from two equal periods of 3 months. The first period, between 15th March and 30th June, corresponding to the entire first wave, and the second, between 1st February and 30th April, corresponding to the entire second wave.

AIM

To study the epidemiology and clinical profile of children suspected to have COVID-19 infection admitted to a designated COVID hospital in 1St and 2nd wave.

II. Material And Methods

Study design

The Protocol of this prospective observational study was approved by the institutional ethical committee of Medical College. Written informed consent was taken from Parents/ guardian of all cases before collection of data.

All hospitalized suspected cases who tested negative for SARS-CoV-2 infection by RTPCR testing admitted between 1st April -30th June 2020 and 1st February – 30th April 2021 was included. All patients admitted between April and June 2020 were considered to be in the first wave and all those admitted between February and April 2021 in the second wave, which divided the study period into two equal parts of three months. Total 209 Children's were admitted as suspected cases and was tested Covid negative by RTPCR testing, out of which 121 was admitted in 1st wave and 88 was admitted in 2nd wave. Thorough demographic, history of residence of hotspot area of Covid-19, history of contact with Covid positive patient, clinical history, and clinical examination was conducted for clinical data. Patient data included age, sex, pre-existing comorbid conditions like Heart disease, Thalassemia and other haematological disorder, Nephrotic Syndrome, Chronic Kidney and Liver diseases, Seizure disorders, Cerebral Palsy, Tuberculosis, Malnutrition, Metabolic disorders, etc.

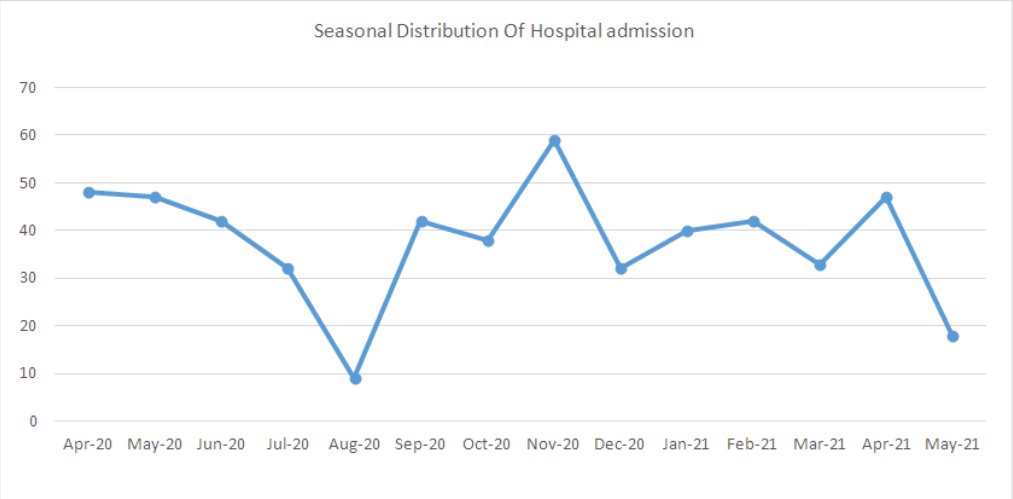
Statistical Analysis

All the above data is given as numbers and percentages or means and standard deviations. Statistical comparisons between two groups were made using the $\chi 2$ test (categorical variables) or the Student's t test. Statistical significance was set at $p \leq 0.05$. All data was entered into excel sheet and calculations were made using the SPSS 25.0 statistical package.

III. Results

During the study period, 209 patients, was admitted in the COVID suspect ward, following the ICMR guidelines and on the basis of clinical suspicion by the COVID consultant on call. The number of patients admitted was 121 in the first wave and 88 in the second wave. The seasonal distribution of hospital admissions is shown in Figure 1.

Figure No.1. Seasonal Distribution of hospitalized suspected COVId-19 paediatric patients.



The first wave peaked in the April month and was followed by a progressive decrease with very few patients being admitted in July and August. The number of cases fluctuated upward from mid-September until a sharp increase in mid- November with decline in the cases in December with again a sharp rise in Feb-April corresponding to second wave.

Out of total 121 patients admitted in 1st wave, no. of female was 47 (38.8%), and no. of male was 74(61.2%) respectively. Whereas out of total 88 patients admitted in 2nd wave of Covid -19, no. of females was 33 (37.5%) and no. male was 55 (62.5%) respectively (Refer table no.1).74 patients (61.2%) were admitted on the basis of SARI (Severe acute Respiratory Infection) in 1st wave and 37 patients (42.0%) were admitted in 2nd wave. 10 patients (8.3%) had a history of contact in 1st wave and 13 patients (14.3%) in 2nd wave. 83 patents (68.6%) resided in hotspot area in 1st wave and 64 patients (72.7%) in 2nd wave (Refer table No.2).

Table No. 1. Epidemiology of Hospitalized suspected Covid-19 paediatric patients in 1st and 2nd wave.

			Covid 1st wave (N=121)	Covid 2nd wave (N=88)	Total	P value
Gender	Female	Number	47	33	80	0.886
		%	38.8%	37.5%	38.3%	
	Male	Number	74	55	129	
		%	61.2%	62.5%	61.7%	
Age		SD	3.24	2.85	3.08	0.409

Table No. 2 Demographic profile, ICMR (Indian Council of Medical Research) criteria for suspicion, and history of contact with a COVID positive person in the children admitted in 1st and 2nd wave.

Parameters	Subgroups		Covid 1st wave (N=121)	Covid 2nd wave (N=88)	Total	P value
Severe Acute Respiratory Infection	No	Number	47	51	98	0.008
		%	38.8%	58.0%	46.9%	
	Yes	Number	74	37	111	
		%	61.2%	42.0%	53.1%	
History of contact with Covid positive patient	No	Number	111	75	186	0.179
		%	91.7%	85.2%	89.0%	
	Yes	Number	10	13	23	
		%	8.3%	14.8%	11.0%	
Resident of hotspot area	No	Number	38	24	62	0.543
		%	31.4%	27.3%	29.7%	
	Yes	Number	83	64	147	
		%	68.6%	72.7%	70.3%	

The relationships between Suspected COVID-19 patients and the clinical and epidemiological variables are shown in Table 3. The most frequent sign and symptom in 1st wave was fever and difficulty in breathing with p value 0.002 which is statistically significant difference. Cough/Cold was also more frequent in 1st wave than in 2nd wave but not statistically significant. However, patients from the second wave differed from those of the first wave, that there was higher frequency of gastrointestinal symptoms (loose stools, vomiting) and Seizures and less frequently with Respiratory signs and symptoms (cough, cold, difficulty in breathing), with p value of 0.01 which is statistically significant.

Table 3. Clinical Characteristics of Hospitalized Suspected patients in 1st and 2nd wave.

Symptom		Covid 1st wave (N=121)	Covid 2nd wave (N=88)	Total	P value
Fever	Number	87	78	165	0.002
	%	71.9%	89.7%	79.3%	
Cough	Number	61	42	103	0.78
	%	50.4%	47.7%	49.3%	
Cold	Number	59	41	100	0.781
	%	48.8%	46.6%	47.8%	
Difficulty in Breathing	Number	43	5	48	<0.0001
	%	35.5%	5.7%	23.0%	
loose stools	Number	11	20	31	0.01
	%	9.1%	22.7%	14.8%	
Vomiting	Number	7	14	21	0.02
	%	5.8%	15.9%	10.0%	
Seizures	Number	12	20	32	0.018
	%	9.9%	22.7%	15.3%	
Altered sensorium	Number	1	0	1	1
	%	0.8%	0.0%	0.5%	
Rash	Number	2	0	2	0.51
	%	1.7%	0.0%	1.0%	
Bleeding Manifestations	Number	3	0	3	0.265
	%	2.5%	0.0%	1.4%	

The most relevant comorbidity in 1st wave was Thalassemia with 6 patients in 1st wave and no Thalassemia patient was admitted in 2nd wave (p value 0.04) which is statistically significant difference. There was no significant difference in the frequency of concomitant chronic diseases. Children with severe acute malnutrition were more in 2nd wave as compared to 1st wave with statistically significant p value of 0.04. (Refer table no.4)

Table 4: Comorbidities in hospitalized suspected patients in 1st and 2nd wave

Comorbidity	Parameter	Covid 1st wave (N=121)	Covid 2nd wave (N=88)	Total	P
Thalassemia	Number	6	0	6	0.041
	%	5.0%	0.0%	2.9%	
CKD	Number	3	0	3	0.265
	%	2.5%	0.0%	1.4%	
Liver disease	Number	2	1	3	0.618
	%	1.7%	1.1%	1.4%	
CHD	Number	3	1	4	0.64
	%	2.5%	1.1%	1.9%	
Seizure Disorder	Number	4	0	4	0.14

	%	3.3%	0.0%	1.9%	
Cerebral Palsy	Number	3	0	3	
	%	2.5%	0.0%	1.4%	0.265
Hydrocephalus	Number	2	0	2	
	%	1.7%	0.0%	1.0%	0.51
Tuberculosis	Number	1	2	3	
	%	.8%	2.3%	1.4%	0.574
Nephrotic Syndrome	Number	0	2	2	
	%	0.0%	2.3%	1.0%	0.176
Bronchial Asthma	Number	1	0	1	
	%	.8%	0.0%	.5%	1
Severe Acute Malnutrition.	Number	4	9	13	
	%	3.3%	10.2%	6.2%	0.04
	Number	1	1	2	
Metabolic Disease	%	.8%	1.1%	1.0%	1
	Number	5	1	6	
Others	%	4.1%	1.1%	2.9%	0.404

IV. Discussion

As the aim of the present study, our main focus was to study paediatric patients admitted in the COVID suspect ward in 1st and 2nd wave rather than studying COVID positive paediatric patients per se. In the present study 121 suspected patients were admitted in 1st wave (from april-june2020) and 88 suspected patients were admitted in 2nd wave (from February-April 2021). Children were admitted on the basis of ICMR criteria for testing clinically suspects. Severe Acute Respiratory Infection (SARI) was one of the criteria in ICMR testing guidelines. In the 1st wave 61.2% were admitted on the basis of SARI criteria, 8.3% were having history of contact with adult covid positive adults and 68.6% resident of hotspot area. In the 2nd wave, 42% were admitted on the basis of SARI criteria, 14.8% were having history of contact with covid positive adult and 70.3% were residing in the hotspot area. All the children's admitted was tested covid RTPCR negative. The majority of cases in children have been found to be asymptomatic or have mild illnesses [15, 16, 17]. Besides the most commonly reported symptoms of fever, cough, and breathlessness [17, 18] studies have also reported various other symptoms in children which include gastrointestinal symptoms [19] multisystem inflammatory syndrome (including Kawasaki's like presentation) [20, 21] and atypical dermatological features [22]. In our study, most frequent signs, symptoms in the 1st wave was respiratory (cough, cold, difficulty in breathing) and in 2nd wave, gastrointestinal symptoms (loose stools, vomiting) and seizures were most common. This shows that there is difference in the clinical presentation in children's admitted in 1st and 2nd wave which could be due to new variant of SARS-CoV, which was found in India in 2nd wave during early summer.

A history of contact with a COVID positive adult has been reported in various studies and positive children have been found to have familial clustering. [16, 17, 23]. However, in the present study children having contact with a known positive adult patient (1st wave-10/121 and 2nd wave-13/88) were tested to be negative and were asymptomatic or having only mild-moderate symptoms. Various explanations have been put forth to explain the relatively low incidence of COVID infection in children. Some of these are timely closure of schools and colleges, less expression of the ACE-2 receptors (primary target receptors of SARS CoV-2), strong innate immune response due to different vaccinations, and relative lack of comorbid conditions, smoking and obesity [24,25]. Recently it has been investigated that, MMR (Measles, Mumps, Rubella) vaccine has a protective role against the infection [1, 25,].

Lastly regarding the associated comorbid condition, the present study did not find any differences between the frequency of Neurological, cardiovascular, Chronic Kidney disease, liver diseases in the two waves. In 1st wave, Thalassemia was most common comorbid condition, whereas Severe Acute malnutrition was most common in 2nd wave.

V. Conclusion

The results of the present study show that Respiratory symptoms (fever, difficulty in breathing, cough, cold) were more frequent in hospitalized patients in the 1st wave and gastrointestinal symptoms (vomiting, loose stools) and neurological symptoms (seizures) were more frequently found in 2nd wave. Most

common comorbid conditions found in children's admitted in 1st wave was Thalassemia and Severe Acute Malnutrition was common in 2nd wave. These results might help to understand the difference in the clinical presentation and severity of infection in children's admitted in both wave. Further studies are needed to confirm our findings. We also found that the majority of children admitted as per the testing Criteria in both wave were found to be COVID negative. Hence, the threshold for suspicion foe Covid-19 infection should be low and adequate Infection Prevention and Control measures are a must.

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