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Original Research Article

Characteristic of COVID-19 infection in pediatric patients: early findings from a tertiary care center, Nagercoil, Tamil Nadu, India

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ABSTRACT

Background: The planet faces a new challenge with COVID-19 disease caused by novel SARS-CoV2. Pediatric COVID-19 is considered to be mild.
Methods: The study aim was to describe the clinical presentation, diagnostic findings and outcome of a cohort of paediatric patients according to Ministry of health and family welfare (MOHFW) criteria, at KKGMCH a tertiary care facility in Kanyakumari district. It's a retrospective chart review including data of children aged 0 to 12 years with COVID-19 from 20 March to 19 July 2020.
Results: Of the 137 children with COVID-19, 17 (12.45%) were infants, 65 (35%) were 1-5 years and 72 (52.55%) were 6-12 years. Age didn't have influence on acquiring the illness as p value is 0.125. Age had no influence on severity too as p value is 0.28. 46.7% were female and 53.3% were male. There was an apparent male preponderance with (OR 1.63, 95% CI 1.00 to 2.21) but a non-significant p value of 0.54. of the 34 (24.8%) mild symptomatic, 22 (64.7%) were males and 12 (35.2%) were females. The p value is 0.086 stating gender non-influential on severity. 129 (94.1%) children had contact history. The contacts were parents or close relatives. No child with comorbidity presented during this period. Most common clinical features were fever (8.76%), cough (6.6%), rhinorrhoea (2.2%), vomiting (2.9%) and diarrhoea (1.5%). Children never progressed to severe respiratory illness requiring intensive care as per MOHFW criteria. 1 (0.7%) presented with focal consolidation in chest x-ray. All 137 (100%) children got cured.
Conclusion: Study concludes pediatric COVID-19 is a mild disease without mortality at beginning of pandemic in Kanyakumari district. Factors like age and gender neither influenced the occurrence of the disease nor the severity.

Keywords: Characteristics, Children, COVID-19

INTRODUCTION

December 31, 2019 has started a new era in the history of the world with a new virus SARS-CoV 2 originated in Wuhan, China causing a deadly pandemic.[1] World has lost half a million lives to this novel deadly disease. More than 175 countries as of now have reported COVID-19 disease.[1]At this time, it appears that severe illness due to COVID-19 is rare among children. American academy of pediatrics (AAP) has documented 7.6% of affected COVID-19 patients are children. Out of which 0.7 to 2% are hospitalized and mortality is only 0 to 0.2%.[2] Studies indicate children have higher viral load and can be a prime source in transmission of disease among the households.[3] Mode of transmission is usually droplet infection, airborne transmission, or direct contact. It is yet to be determined whether vertical transmission or transmission through breast milk can occur from mother to baby.

Children are infected equally like adults, but less likely to develop severe disease.[4,5] AAP data suggest children with severe COVID-19 usually have underlying medical condition which is a similar pattern in adults. Most

common comorbidities seen are obesity, diabetes, and neurological conditions.[6] Rarely children may present with a severe illness due to COVID-19, Multisystem inflammatory syndrome in children (MIS-C).[6] Case fatality is rare in children but may occur.[7] Overall it is considered that children with COVID-19 disease have excellent prognosis.[8]

Hence this study is to add data regarding key clinical characteristic and outcome of the disease in native pediatric population. Cases were confirmed for COVID-19 disease based on national recommendations by MOHFW.[9]

Aim of the study was to describe the clinical presentation, diagnostic findings and outcome of a cohort of pediatric patients with confirmed COVID-19 disease using data collected from pediatric patient's records at KKGMCH a tertiary care facility in Kanyakumari district.

METHODS

This study is a retrospective chart review of children aged 0 to 12 years who were confirmed with COVID-19 disease from March 20th to July 19th 2020 at KKGMCH. Nagercoil, Tamil Nadu, India.

All children with confirmed COVID-19 disease were included in the study. The first COVID-19 pediatric case was documented on March 20th in our facility. This 4-month period marked the start of the pandemic in Kanyakumari district. Cases were confirmed for COVID-19 disease based on national recommendations during the study period.[9] COVID-19 disease was diagnosed using nasal or nasopharyngeal swab specimens collected by trained personnel according to the national recommendations and tested for COVID-19 virus nucleic acid in approved regional laboratories using WHO-recommended real-time reverse transcriptase polymerase chain reaction (RT-PCR) assays. Data regarding clinical presentation, severity findings, comorbidity, laboratory investigation and radiological investigation were collected from the medical case records and entered in a proforma. Disease severity was classified based on predefined criteria of MOHFW India.[9] The data collected were analysed with appropriate statistical tests using SSPS23.0 version.

The current guidelines recommend admission in an isolation facility for all positive cases. Appropriate antibiotic usually may be prescribed, if respiratory rate is high.

Supportive care

Control of fever using paracetamol (10-15 mg/kg/dose SOS/q 4-6 hourly if required); avoid Ibuprofen and other NSAIDs. Ensure adequate hydration. Danger signs should be explained to parents or guardian. The data collected were analysed with appropriate statistical tests using SSPS23.0 version.

RESULTS

Categorical variables were reported as absolute numbers (frequency) and percentages and compared using the χ^2 and by calculating odds ratios (OR) with confidence intervals of 95% (95% CI). The significance level was set at 0.05 (two-tailed test). Continuous variables were expressed as mean and standard deviation or as median (IQR) if not normally distributed. Data were analysed with IBM. SPSS statistics software 23.0 Version.

Overall, there were 137 children with confirmed COVID-19 infection. All 137 children were included in the study of which infants were 17 (12.45%), 65 children (35%) were 1 to 5 years of age and 72 children (52.55%) belonged to 6-12 years of age.

In table-3 chi square value 4.16. The p value is 0.125. The result is not significant at $p<0.05$. The age of these children doesn't show any influence on acquiring the illness.

Severity of COVID-19 and age distribution

Out of the 34 children presented with mild COVID-19 illness 5 (14.7%) were infants less than 1 year, 14 (41.2%) were of 1 to 5 years of age and 15 (44.1%) were 6 to 12 years of age. In table 4 chi square value is 2.509. The p value is 0.28. The result is not significant at $p<0.05$. Results reveal no influence of age in severity of COVID-19 disease too.

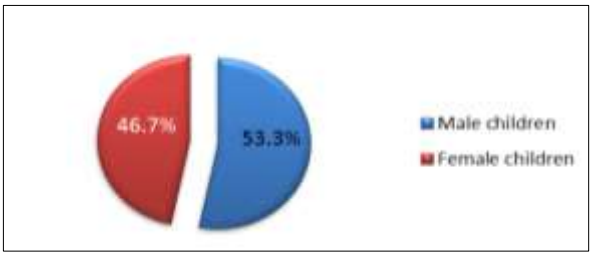

Figure 1: Gender distribution.

Distribution by gender showed a slight male predominance with male children as shown in figure 1 and OR 1.63, (95% CI 1.00 to 2.21), but table 5 gives χ^2 of 0.46 and p value 0.54. This reflects that gender has no influence in children for Covid19 disease. Out of the 34-mild symptomatic COVID-19 children 22 were male (64.7%) and 12 children were female (35.2%). This shows an apparent increase in symptomatic child with male gender. But table 6 shows chi square value is 2.941. The p value is 0.086. The result is not significant at $p<0.05$. Hence gender is not an influential factor for severity of COVID-19 illness.

Table 1: Clinical severity assessment parameters (Guidelines of MOHFW).

Clinical severity	Assessment parameters	Characteristics
Mild	Without evidence of breathlessness or hypoxia (normal saturation).	Patients with uncomplicated upper respiratory tract infection like fever, cough, sore throat, nasal congestion, and malaise, headache without evidence of breathlessness or hypoxia (normal saturation).
Moderate	Pneumonia with no signs of severe disease	Child with presence of clinical features of dyspnea and or hypoxia, fever, cough, including SpO_2 <94% (ranging 90% to 94%) on room air and respiratory rate more or equal to 24 per minute. Fast breathing (in breaths per minute) <2 months: ≥60; 2-11 months: ≥50; 1-5 years: ≥40
Severe	Severe pneumonia	1.Child with cough or difficulty in breathing, plus at least one of the following: central cyanosis or SpO_2 <90%; severe respiratory distress (e.g. grunting, chest in-drawing) 2. Signs of pneumonia with any of the following danger signs: inability to breastfeed or drink, lethargy or unconsciousness, or convulsions. 3. Other signs of pneumonia may be present: chest in drawing, fast breathing (in breaths/min): <2 months ≥60; 2-11 months ≥50; 1-5 years ≥40. The diagnosis is clinical; chest imaging can exclude complications
	ARDS (acute respiratory distress syndrome)	Oxygenation impairment in children note oxygenation index (OI) and OSI (oxygen saturation index) use OI when available. If PaO2 not available, wean FiO2 to maintain SpO2 <97% to calculate OSI or SpO2/FiO2 ratio using SpO2 Bi-level (NIV or CPAP) ≥5 cm H2O via full face mask: PaO2/FiO2 ≤300 mmHg or SpO2/FiO2 ≤264 Mild ARDS (invasively ventilated): 4≤OI<8 or 5≤OSI< 7.5 Moderate ARDS (invasively ventilated): 8≤OI<16 or 7.5≤OSI<12.3 Severe ARDS (invasively ventilated): OI≥16 or OSI≥12.3
	Sepsis	Suspected or proven infection and ≥2 age based Systemic Inflammatory Response Syndrome (SIRS) criteria, of which one must be abnormal temperature or white blood cell count
	Septic shock	Any hypotension (SBP 2 SD below normal for age) or 2- 3 of the following: altered mental state; bradycardia or tachycardia (HR 160 bpm in infants and HR 150 bpm in children); prolonged capillary refill (>2 sec) or weak pulse; tachypnea; mottled or cool skin or petechial or purpuric rash; high lactate; reduced urine output; hyperthermia or hypothermia

Table 2: Age distribution.

Age (years)	No. of children	Percentage (%)
0-1	17	12.45
1-5	48	35
6-12	72	52.55

Table 3: Influence of age on illness.

Age (years)	Observed	Expected	Difference	Difference Sq.	Diff. Sq. / Exp Fr.
<1	17	11	6.00	36.00	3.27
1-5	48	46	2.00	4.00	0.09
6-12	72	80	-8.00	64.00	0.80
Total					4.160

Table 4: Severity of illness and age.

Age (years)	Observed	Expected	Difference	Difference Sq.	Diff. Sq. / Exp Fr.
<1	5	3	2	4	1.33
1-5	14	12	2	4	0.33
6-12	15	19	-4	16	0.84
Total					2.509

Table 5: Gender distribution.

Gender	Observed	Expected	Difference	Difference Sq.	Diff. Sq. / Exp Fr.
Male	73	69	4	16	0.23
Female	64	68	-4	16	0.24
Total					0.467

Table 6: Severity of illness and gender.

Gender	Observed	Expected	Difference	Difference Sq.	Diff. Sq. / Exp Fr.
Male	22	17	5.00	25.00	1.47
Female	12	17	-5.00	25.00	1.47
Total					2.941

Table 7: Sociodemographic profile and disease severity (n=137).

Characteristics	N (%)	P value	
Median age (years)	7 (0-12)	Na	
Age groups (years)			
0-1	17 (12.45)	p>0.05	
1-5	48 (35)		
6 to 12	72 (52.55)		
Gender		P=0.46	
Male child	73 (53.3)		
Female child	64 (46.7)		
Contact with COVID-19 (+)	129 (94.1)		NA
Travel from epidemic area	22 (16)		NA
Disease severity			NA
Asymptomatic	105 (75.18)		
Mild	34 (24.81)		
Moderate	0 (0)		
Severe	0 (0)		
Symptoms and signs			NA
Fever	12 (8.76)		
Cough	9 (6.6)		
Sore throat	9 (6.6)		
Rhinorrhea	3 (2.2)		
Vomiting	4 (2.9)		
Diarrhea	2 (1.5)		
Oxygen saturation level at presentation <92% in Room air	0 (0)		
Laboratory test			NA
White blood cell count <4.5 ($\times 10^9$/L)	7 (5.1)		
Lymphocyte count <1.2 ($\times 10^9$/L)	0 (0)		
Chest X-ray			NA
Focal consolidation	1 (0.72)		
Normal	136 (99.28)		

Continued.

Characteristics	N (%)	P value
Outcome		NA
Cured	137 (100)	
Death	0 (0)	

Contact with COVID-19 persons

129 (94.1%) children had positive contact history with COVID-19 cases. Most of the contact were parents or close relatives. No child with comorbidity presented with COVID-19 disease during this period.

DISCUSSION

Over the last 3 months rise in COVID-19 disease was noted in Kanyakumari district. This resulted in influx of pediatric cases too into our tertiary care facility. The world is yet to develop complete knowledge and is in evolving stage of understanding the presentation, severity and complication of the disease.[10] This study has showed that COVID-19 disease is evenly distributed irrespective of any influence of age in pediatric population.[11] The study is in accordance with the systematic review by Castagnoli et al, Ludvigson et al and Namita et al revealing pediatric COVID-19 disease is milder and less severe.[12-14] This study is also in accordance with Dong Y et al stating, gender has no influence on the occurrence or severity of this disease.[15]

As expected, the most common vector for childhood infection is close contact to an affected family member or residing in an area with a high population of cases. The findings noted were in align with the results of a report by Qiu et al and Bi et al, in which asymptomatic pediatric cases identified were secondary to an adult family member who was infected, symptomatic, or travelled to an endemic.[16,17] This raises the concern that children who are asymptomatic and active or having only milder infection plays a key role in transmission by bridging the infection from infected adult to non-infected healthy adults overtly resulting in community transmission. The findings (table-5) were similar to meta-analysis done by Rodriguez-Morales et al, Souza et al stating most common clinical manifestations found in children were fever (8.76%), cough (6.6%), rhinorrhoea (2.2%), vomiting (2.9%) and diarrhoea (1.5%).[18,19] Children in this study never progressed to severe upper respiratory symptoms requiring intensive care unit admission as per MOHFW criteria. All 137 (100%) children got cured and were discharged. Only 34 (24.8%) children developed mild disease according to MOHFW criteria for COVID-19 disease in children. All were efficiently treated with antibiotics and supportive measures and were cured and discharged concluding pediatric COVID-19 is a milder disease with excellent prognosis as in Wang et al.[20]

During this study period 15 babies were delivered from COVID-19 positive mothers. Out of the 15 babies only 1 neonate (6.6%) turned to be COVID-19 positive. This baby was roomed in with the mother during early neonatal period and had contact with COVID-19 positive mother and became COVID-19 positive on day 6 of life. Nasopharyngeal swabs were taken at 24 hours of life, day 6 and at discharge. This affirms the possibility of contact transmission in the baby as the baby was COVID-19 negative at 24 hours of life. The neonate was cured and then discharged. This study like Posfay-Barbe et al emphasize on awareness on social distancing, hand hygiene and isolation of asymptomatic cases including pediatric cases who act as a key in family and community spread during early phase of spread of the disease as they are mostly asymptomatic.[21,22] This study shall give a base for more extensive studies in future and can also help to analyse the pattern of pediatric COVID-19 disease during this pandemic in native population.

Limitation of the study

The limitation of the study is as this was the early phase of epidemic; the number of children studied was less and did not include children with comorbidity. Further extended studies in detail are needed for thorough comprehensive conclusions regarding pediatric COVID-19 disease.

CONCLUSION

This study suggests that pediatric COVID-19 disease was mild and without mortality in beginning of the pandemic in Kanyakumari district. Most of the children acquired infection from a contact who is usually their parents or close relatives. Factors like age and gender neither did significantly influence the occurrence of the disease nor influenced the severity of the disease. This preliminary study paves a platform for more extended studies in pediatric COVID-19 disease in native pediatric population.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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