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ASSOCIATION OF PEDIATRIC PATIENTS' SYMPTOMATOLOGY TO SARS-COV-2 SEROLOGY

Prof. Dr. Hanif Memon[1*], Prof.Dr.Shahaina Hanif[2], Farhan Saeed[3], Dr.Erum Saboohi[4], Dr.Sadaf Saeed Shami[5], Dr.Sarah Aslam[6], Dr.Madiha Batool Zaheer[7].

[1*]Professor of Paediatrics, Karachi Adventist Hospital Pakistan. email: mhmemon_9@hotmail.com
[2]Professor of Paediatrics, United college of medicine and dentistry Karachi Pakistan. email: shahinahanif380@gmail.com
[3]Associate Professor of Paediatrics, Liaquat College of Medicine and Dentistry Karachi Pakistan. email: dr.farhansaeed21@gmail.com
[4]Professor of Paediatrics, Karachi Institute of Medical Sciences, Malir Cantt Karachi Pakistan. email: erumsaboohi@gmail.com
[5]Assistant Professor of Paediatrics, Liaquat College of Medicine and Dentistry Karachi Pakistan. email: sadafshami@hotmail.com
[6]Assistant Professor of Paediatrics, Liaquat College of Medicine and Dentistry Karachi Pakistan. email: sarahaslam892@gmail.com
[7]Medical Officer in Pediatrics, Liaquat College of Medicine and Dentistry Karachi Pakistan.

***Corresponding Author:** Prof. Dr. Hanif Memon
[*]Professor of Paediatrics, Karachi Adventist Hospital Pakistan. email: mhmemon_9@hotmail.com

Abstract

Background : To study the association of pediatric patients' symptomatology to Sars-CoV-2 serology.
Subjects and Methods :This prospective cross sectional study was conducted at Karachi Adventist Hospital between January to August 2021. Patients count 232 enrolled from from OPD and IPD with fever, cough , difficulty in breathing , vomiting and diarrhea . Association of covid 19 serology with patients symptomatology and various study parameters was analyzed using Pearson chi square test . P-values less than 0.05 were considered statistically significant.
Results: Among enrolled subjects between five years till 15 year of age , 59.5 % were male with a male to female ratio of 1.46:1 . Among participants 80.6% had fever >100.4^{0}F, 41.8% with cough, 31.5% with sore throat, 78.4% with respiratory rate <50 /min, 19.8% with sub costal recession, 44.4% with lose motions and 58.6% were found with complain of vomiting. Among samples with IgM+ serology, all were with fever >100.4 F, 35% with Malaise , 75% with cough, 70% with sore throat, 60% with respiratory rate >50 /minute, 60% with sub costal recession, 40% with lose motion, 35% with vomiting.
Maternal education level , history of close contact with covid 19 proven cases showed statistically significant association with positive covid 19 serology .Cough , sore throat , respiratory rate and subcostal recession also showed statistically significant association with Sars-CoV-2 serology.
Conclusion : Our study showed positive serology in covid 19 suspects who had predominantly respiratory complaints and had history of contact with PCR positive adults .

Key words : covid 19, pediatric patients, serology

Introduction

SARS-CoV-2 belongs to the family of Coronaviridae and is a positive-sense RNA virus[1]. The Program for Monitoring Emerging Diseases was informed on December 30, 2019, regarding pneumonia of unknown etiology in Wuhan, China[2]. The aWorld Health Organization (WHO) officially declared that SARS-COV-2 causes the current COVID-19 disease on February 11,2020[3]. In Pakistan, the first case of COVID-19 was encountered in Karachi, the capital of Sindh province, on February 26, 2020, and spread swiftly throughout the whole country[4]. In children, the severity of COVID-19 is rare.

It mainly presents with difficulty in breathing, cough, and fever. Pneumonia, renal failure, and death are the complications of severe disease[5]. The infection rate of COVID-19 is very high. It is transmitted directly through aerosols, saliva, feco-oral secretions, semen, tears, and also from mother to child. At the same time, fomites are an indirect mode of transmission[6]. The duration of survival for the Covid-19 virus is about 3 - 72 hours. The standard gold test for its detection is Polymerase chain reaction (PCR)[7].

Covid-19 in children is mainly asymptomatic or present with mild symptoms. Due to extensive testing for adults or patients with severe illness in children, the true incidence of COVID-19 is not known[8]. For patients who suffered and recovered from the disease and also had no or mild symptoms, serological tests are used to detect antibodies[9]. The antibody test is more reliable for detecting previously asymptomatic or mildly symptomatic cases than RT-qPCR (real-time reverse transcription PCR)[10]. The mode of treatment is primarily supportive in children due to the mild nature of the disease. The risk of severe disease is higher among children with hematological disorders, immunodeficiencies, congenital heart diseases, and chronic kidney, lung, and liver diseases [11.] Children have a low case fatality rate. Comorbidities are less frequent in children. However, some children develop the multisystem inflammatory syndrome. With the progression of the pandemic, an increasing number of severe cases are reported with the multisystem inflammatory syndrome in children (MIS-C) having COVID-19[12]

Healthcare professionals are highly concerned as there are weak evidence-based data about COVID-19 disease on which to formulate clinical decisions.

This study aimed to determine the presence of SARS-CoV-2 antibodies in symptomatic and asymptomatic children.

Subjects and Methods

This cross-sectional study was conducted at Karachi Adventist Hospital from January 2021 to August 2021.It was estimated using an online sample size calculator available at www.openepi.com version 301, using the method of proportion after inserting a 2% expected rate of COVID in children from Pakistan[11] at a 5% margin of error and 95% confidence interval we required at least n=146 samples for this study.

After taking permission from the ethical review committee of the institute, all children from 6 months to 14 years who came to the Outpatient department (OPD) or were admitted (IPD) in the hospital with a complaint of fever, cough, difficulty in breathing, vomiting, and diarrhea were included in this study with prior informed consent from the parents or caretaker. Parents who did not agree to give consent, children with cerebral palsy, tuberculosis, celiac disease, cystic fibrosis, malignancies, and patients on immunosuppressive drugs were excluded from the study.

The Questionnaire was based on when and for which complaints the child was admitted or visited OPD, searching for adult contact through questioning and available Covid19 PCR report and relevant investigations for children were done. Focused interviews of parents /caretakers and relevant investigations were documented on the datasheet. Data was kept under the supervision of an investigator.

Data were stored and analyzed using IBM-SPSS version 23.0; Counts with percentages were reported for baseline characteristics and symptoms of Covid-19. The Association of Covid-19 serology was also tested using the Pearson Chi-Square test; p-values less than 0.05 were considered statistically

significant. A bar diagram was also used to give the association of covid-19 serology with a history of close contact with covid-19 proven cases.

Results:

Table 1 reports the baseline characteristics of studied samples; in the present study, there were 232 samples 54.7% were aged between 10.1 – 15 years, 59.5% were male gender, 58.6% with undergrad father education, 76.7% with undergrad mother education, 55.6% with a private job status of the father, 72.4% with housewife mother. Histories of close contact with covid-19 prove that 49.6% of samples reported cases.

Table 2 reports the reported symptoms of Covid-19, there were 80.6% found with a fever >100.4 F, 20.7% with Malaise (> 5 years of Age), 41.8% with cough, 31.5% with a sore throat, 78.4% with respiratory rate <50 /min, 19.8% with a subcostal recession, 44.4% with lose motions and 58.6% were found with complain of vomiting.

Table 3 reports the association of covid-19 serology with baseline characteristics; among samples IGM+, 45% were 5.1 – 10 years old, 50% were female, 45% with undergrad father education, 75% with undergrad mother education, 55% with a private job status of the father, 60% with housewife mother, 65% were found with a history of close contact with a covid-19 proven case. Among samples with IgG+, 31.7% were 5.1 – 10 years old, 36.6% were female, 41.5% with undergrad father education, 58.5% with undergrad mother education, 65.9% with a private job status of the father, 73.2% with housewife mother, 70.7% were found with a history of close contact with covid-19 proven case, whereas among negative samples 45% were 5.1 – 10 years old, 40.4% were female, 64.3% with undergrad father education, 81.3% with undergrad mother education, 53.2% with a private job status of the father, 73.7% with housewife mother, 42.7% were found with a history of close contact with the covid-19 proven case. Pearson Chi-Square test gives a significant association of covid-19 serology with father education, mother education, and history of close contact with a covid-19 proven case with $p<0.01$.

Table 4 reports the association of covid-19 serology with symptoms; among samples, IGM+ all were with fever >100.4 F, 35% with Malaise, 75% with cough, 70% with a sore throat, 40% with respiratory rate <50 /minute, 60% with a subcostal recession, 40% with loose motion, 35% with vomiting. Among samples with IgG+ 80.5 were with fever >100.4 F, 29.3% with Malaise, 36.6% with cough, 26.8% with a sore throat, 80.5% with respiratory rate <50 /minute, 14.6% with subcostal recession, 31.7% with loose motion, 61% with vomiting, whereas among negative samples 78.4% were with fever >100.4 F, 17% with Malaise, 39.2% with cough, 28.1% with a sore throat, 82.5% with respiratory rate <50 /minute, 16.4% with a subcostal recession, 48% with loose motion, 60.8% with vomiting. Pearson Chi-Square test gives a significant association of Covid-19 serology with cough, sore throat, respiratory rate, and subcostal recession, $p<0.01$.

Table 1: Baseline Characteristics of Studied Samples (n=232)

Characteristics		**N**	**%**
Age (years)	**0.5 -5**	6	2.6
	5.1 -10	99	42.7
	10.1 -15	127	54.7
Gender	**Male**	138	59.5
	Female	94	40.5
Father Education Level	**None**	1	0.4
	Undergrad	136	58.6
	Graduate	95	40.9
Mother Education Level	**None**	4	1.7
	Undergrad	178	76.7
	Graduate	50	21.6
Father Occupation	**Businessman**	32	13.8
	Private job	129	55.6

	Shopkeeper	18	7.8
	Laborer	52	22.4
	Jobless	1	0.4
Mother Occupation	**Housewife**	168	72.4
	Working	64	27.6
History of Close Contact with COVID-19 Proven Case	**Positive**	115	49.6
	Negative	117	50.4

Table 2: Reported Symptoms of Covid-19

Symptoms		**n**	**%**
Fever >100.4 F	**Yes**	187	80.6
	No	45	19.4
Malaise (>5 years of Age)	**Yes**	48	20.7
	No	184	79.3
Cough	**Yes**	97	41.8
	No	135	58.2
Sore Throat	**Yes**	73	31.5
	No	159	68.5
Respiratory Rate	**<50 / minute**	182	78.4
	>50 / minute	50	21.6
Sub costal Recession	**Yes**	46	19.8
	No	186	80.2
Loose Motions	**Yes**	103	44.4
	No	129	55.6
Vomiting	**Yes**	136	58.6
	No	96	41.4

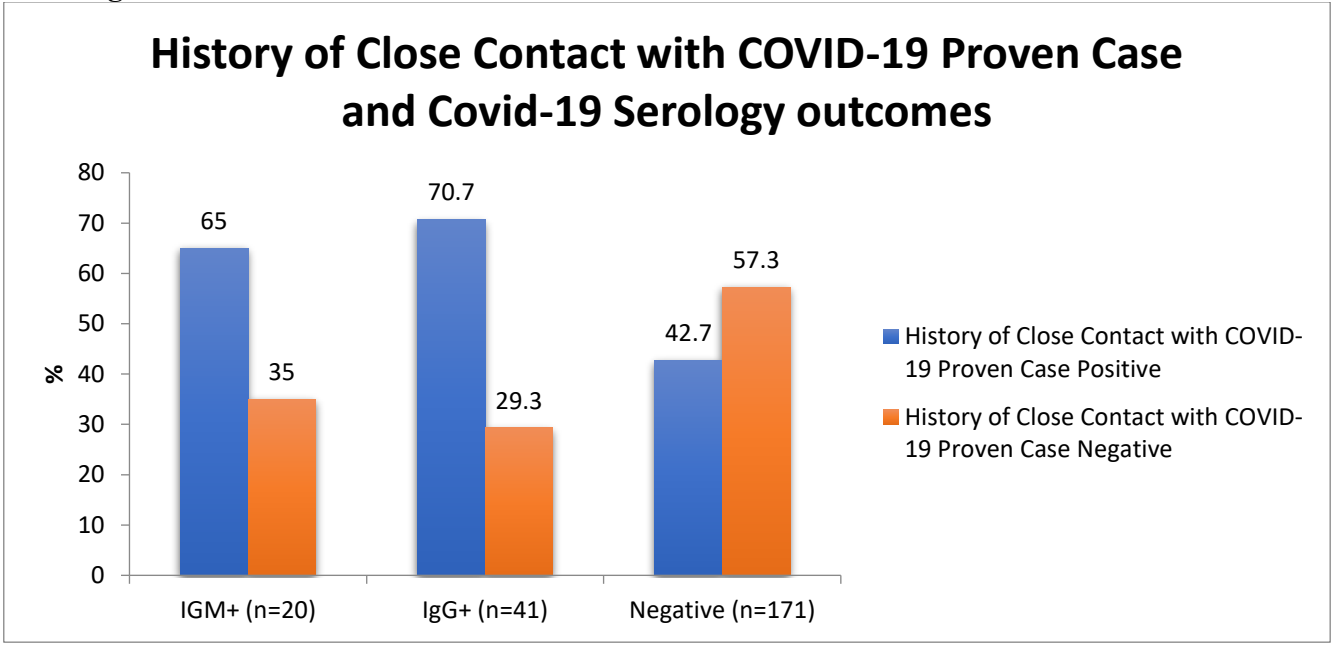
Table 3: Association of COVID-19 Serology with Baseline Characteristics

Characteristics		**COVID-19 Serology**						**p-value**
		IGM(n=20)		**IgG+(n=41)**		**Negative(n=171)**		
		n	**%**	**n**	**%**	**n**	**%**	
Age (years)	**0.5 -5**	2	10.0	1	2.4	3	1.8	0.11
	5.1 -10	9	45.0	13	31.7	77	45.0	
	10.1 -15	9	45.0	27	65.9	91	53.2	
Gender	**Male**	10	50.0	26	63.4	102	59.6	0.60
	Female	10	50.0	15	36.6	69	40.4	
Father Education Level	**None**	1	5.0	0	0.0	0	0.0	<0.01*
	Undergrad	9	45.0	17	41.5	110	64.3	
	Graduate	10	50.0	24	58.5	61	35.7	
Mother Education Level	**None**	1	5.0	2	4.9	1	0.6	0.01*
	Undergrad	15	75.0	24	58.5	139	81.3	
	Graduate	4	20.0	15	36.6	31	18.1	
Father Occupation	**Businessman**	3	15.0	5	12.2	24	14.0	0.40
	Private job	11	55.0	27	65.9	91	53.2	
	Shopkeeper	1	5.0	3	7.3	14	8.2	
	Laborer	5	25.0	5	12.2	42	24.6	
	Jobless	0	0.0	1	2.4	0	0.0	
Mother Occupation	**Housewife**	12	60.0	30	73.2	126	73.7	0.42
	Working	8	40.0	11	26.8	45	26.3	
History of Close Contact with COVID-19 Proven Case	**Positive**	13	65.0	29	70.7	73	42.7	<0.01*
	Negative	7	35.0	12	29.3	98	57.3	
*p<0.05 was considered statistically significant using the Pearson Chi-Square test								

Table 4: Association of Covid-19 Serology with Symptoms

Symptoms		COVID-19 Serology						p-value
		IGM+ (n=20)		IgG+ (n=41)		Negative (n=171)		
		n	%	n	%	n	%	
Fever >100.4 F	Yes	20	100.0	33	80.5	134	78.4	0.06
	No	0	0.0	8	19.5	37	21.6	
Malaise (>5 years of Age)	Yes	7	35.0	12	29.3	29	17.0	0.05
	No	13	65.0	29	70.7	142	83.0	
Cough	Yes	15	75.0	15	36.6	67	39.2	<0.01*
	No	5	25.0	26	63.4	104	60.8	
Sore Throat	Yes	14	70.0	11	26.8	48	28.1	<0.01*
	No	6	30.0	30	73.2	123	71.9	
Respiratory Rate	<50 / minute	8	40.0	33	80.5	141	82.5	<0.01*
	>50 / minute	12	60.0	8	19.5	30	17.5	
Sub costal Recession	Yes	12	60.0	6	14.6	28	16.4	<0.01*
	No	8	40.0	35	85.4	143	83.6	
Loose Motions	Yes	8	40.0	13	31.7	82	48.0	0.15
	No	12	60.0	28	68.3	89	52.0	
Vomiting	Yes	7	35.0	25	61.0	104	60.8	0.08
	No	13	65.0	16	39.0	67	39.2	
*p<0.05 was considered statistically significant using the Pearson Chi-Square test								

Bar Diagram 1:



Discussion:

Sars Co-V-2 ,thre coronavirus epidemic has led to enormous adult and senile mortality and morbidity, though pediatric cases lag behind suggesting age as a protective factor[13], postulating immunosenescence and available viral binding sites as underlying causes[14]. Our study showed majorly affected patients aged > 10 years with the predominantly male gender. Worldwide data reports the variable gender distribution among COVID-19 children,[15, 16]

Common symptomatology in our pediatric population with suspected covid was fever and cough followed by sore throat, an observation also noticed in a large study population(n=2143) of children aged 0 to 18 years done by Chinese CDCP where fever and dry cough was the common symptoms in proven or suspected cases [17]. Karron and colleagues studied covid 19 community infection in children

aged 0 to 4 years in Maryland households and found largely asymptomatic infection in this particular age group[18].

Most of our patients lack the typical respiratory distress pattern of illness, contrary to adult patients, whose predominant symptomatology was respiratory distress or failure during covid pandemic[19]. Our observations match the study conducted on 45 pediatric proven covid subjects, in 2021 in Karachi, where 40% showed signs of distress and 10% progressed to respiratory failure[20].

A fairly large majority of patients were observed to have loose motions and vomiting. Research suggests stomach trouble is more predictive of covid virus in young children than cough. A literature search showed that after initial covid infection, children showed prolonged fecal shedding of virus[21], and they have more nasopharyngeal carrier state in the upper part of the respiratory tract[22]. Moreover in a study at Indus hospital Karachi, 53 % of children showed gastrointestinal symptoms of severe covid infection. They studied a retrospective chart view of covid 19 childrens' epidemiology and clinical outcomes at their healthcare facility.[23]

In our cohort, 45% of cases showed active immunity against (IgM positivity) against covid 19 infection and 65% of them showed close contact with proven covid 19 adult cases. Among the IgG-positive cases,70.7 showed close contact with Covid PCR positive adults. Evidence shows that even children have the potential to have stronger antibody responses than adults[24].

Conclusion

The covid 19 antibody response of pediatric patients offers a unique chance to learn more about illness pathophysiology and to help guide future screening and treatment research. Our study found positive serology in covid 19 suspects who had close contact with PCR-positive adults.

Correspondance to :

Authors' Contribution

Mohammad hanif Memon	Conception and design , final approval of version for publication ,supervision in acquisition of data
Farhan Saeed and Shahina Hanif	Drafting the manuscript and revising it critically for important intellectual content
Erum Saboohi ,Sadaf Saeed Shami	Data analysis, Interpretation of data
Sarah Aslam /Madiha Batool Zaheer	Acquisition of data ,Data analysis

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