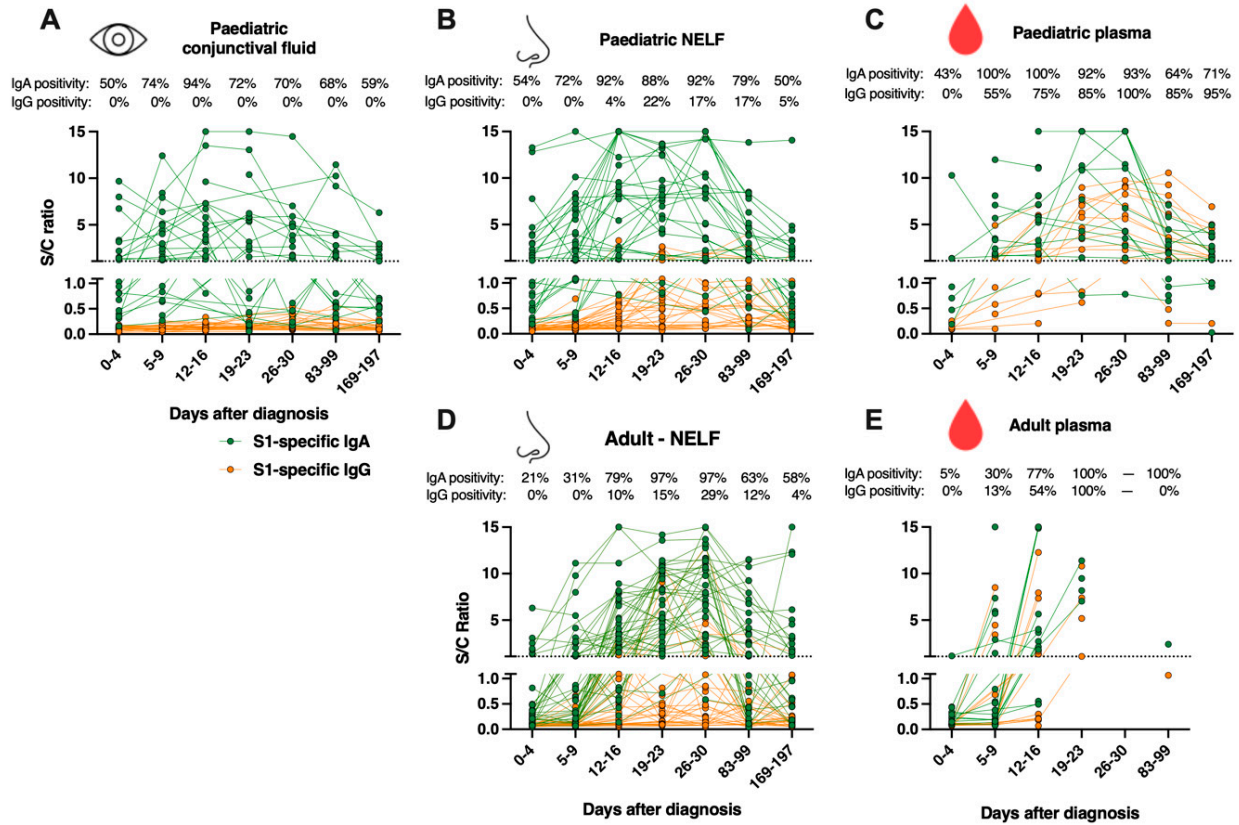


Supplementary Material



Supplementary Figure S1. SARS-CoV-2 S1-specific antibody levels in COVID-19 patients.

The longitudinal changes of S1-specific IgA (green dot) and IgG (orange dot) in the (A) conjunctival fluid, (B) nasal epithelial lining fluid (NELF) and (C) plasma of paediatric patients and the (D) NELF and (E) plasma of adult patients were plotted. Data points above the dotted line (Sample/Calibrator (S/C) ratio ≥ 1.1) are considered positive, while $y=15$ indicates the upper detection limit of the assay. The percentages denote the IgA and IgG positivity at each time point.

A. Conjunctival Fluid (CF) - IgA

Days post diagnosis		0-4	5-9	12-16	19-23	26-30	83-99	169-197
All Paediatric patients	No. of sample	20	22	17	18	20	19	17
	%	50	74	94	72	70	68	59
Asymptomatic	n	9	9	5	5	8	8	7
	Median ± IQR	0.9±6.8	2.1±3.2	2.3±2.4	0.7±4.0	1.0±1.9	1.1±2.3	0.6±1.4
Symptomatic	%	44	67	80	40	50	50	43
	n	11	13	12	13	12	11	10
Symptomatic	Median ± IQR	1.3±1.8	1.9±7.1	5.4±6.3	5.6±7.0	5.0±4.6	2.8±5.5	2.1±3.1
	%	55	77	100	85	83	82	70
Mann-Whitney test between groups	<i>p</i> value	0.8820	0.5556	0.0365	0.1433	0.0252	0.1087	0.0431
Fisher's Exact test between groups	<i>p</i> value	ns	0.6550	0.2941	0.0987	0.1611	0.3189	0.3500

B. Nasal epithelial lining fluid (NELF) - IgA

Days post diagnosis		0-4	5-9	12-16	19-23	26-30	83-99	169-197
Paediatric patients	No. of sample	28	29	25	25	24	24	22
	%	54	72	92	88	92	79	50
Asymptomatic	n	11	10	6	7	7	8	7
	Median ± IQR	2.9±6.3	5.8±6.1	9.3±13.0	8.7±8.7	7.1±9.3	2.2±4.9	0.7±2.1
Symptomatic	%	82	90	83	86	86	63	43
	n	17	19	19	18	17	16	15
Symptomatic	Median ± IQR	0.7±1.3	1.5±3.1	8.2±12.7	7.7±8.8	8.3±10.7	3.1±5.6	1.8±2.4
	%	35	63	95	89	94	88	53
Mann-Whitney test between groups	<i>p</i> value	0.0017	0.0854	0.7778	0.9400	0.4641	0.4167	0.1417
Fisher's Exact test between groups	<i>p</i> value	0.0238	0.2008	0.4300	ns	0.5072	0.2885	ns

D. Plasma - IgA

Days post diagnosis		0-4	5-9	12-16	19-23	26-30	83-99	169-197
Paediatric patients	No. of sample	7	11	12	13	13	14	14
	%	43	100	100	92	92	64	71
Asymptomatic	n	1	7	3	1	2	4	4
	Median ± IQR	0.200	6.8±6.2	11.0±5.4	6.800	2.8±2.9	0.8±1.0	1.0±2.8
Symptomatic	%	0	100	100	100	100	25	25
	n	6	4	9	12	11	10	10
Symptomatic	Median ± IQR	1.1±1.4	2.9±3.6	5.2±5.3	10.9±11.2	11.0±11.5	2.5±3.7	1.9±2.8
	%	50	100	100	92	91	80	90
Mann-Whitney test between groups	<i>p</i> value	-	0.2303	0.1455	-	0.2821	0.0759	0.1419
Fisher's Exact test between groups	<i>p</i> value	-	ns	ns	-	ns	0.0949	0.0410

C. NELF - IgG

Days post diagnosis		0-4	5-9	12-16	19-23	26-30	83-99	169-197
Paediatric patients	No. of sample	26	26	24	23	24	24	22
	%	0	0	4	22	17	17	5
Asymptomatic	n	10	8	6	5	7	8	7
	Median ± IQR	0.1±0.1	0.2±0.1	0.5±0.9	0.6±0.3	0.2±0.4	0.4±0.5	0.1±0.1
Symptomatic	%	0	0	17	0	0	13	0
	n	16	18	18	18	17	16	15
Symptomatic	Median ± IQR	0.1±0.0	0.1±0.1	0.2±0.2	0.5±1.2	0.6±1.0	0.4±0.8	0.2±0.3
	%	0	0	0	28	24	19	7
Mann-Whitney test between groups	<i>p</i> value	0.1956	0.0293	0.1008	0.8006	0.0389	0.4614	0.0319
Fisher's Exact test between groups	<i>p</i> value	ns	ns	0.2500	0.5453	0.2833	ns	ns

E. Plasma - IgG

Days post diagnosis		0-4	5-9	12-16	19-23	26-30	83-99	169-197
Paediatric patients	No. of sample	7	11	12	13	13	13	14
	%	0	55	75	85	100	85	86
Asymptomatic	n	1	7	3	1	2	3	4
	Median ± IQR	0.100	1.7±4.5	7.1±5.7	2.800	2.2±1.4	2.0±4.9	1.8±1.0
Symptomatic	%	0	57	100	100	100	100	75
	n	6	4	9	12	11	10	10
Symptomatic	Median ± IQR	0.1±0.1	1.0±1.1	1.3±3.0	5.2±4.7	7.0±4.8	4.8±6.6	2.3±3.2
	%	0	50	67	83	100	80	90
Mann-Whitney test between groups	<i>p</i> value	-	0.4121	0.0364	-	0.1538	0.4685	0.3037
Fisher's Exact test between groups	<i>p</i> value	-	ns	0.5091	-	ns	ns	0.5055

Table S1. Comparisons of the SARS-CoV-2 S1-specific antibody levels between asymptomatic vs symptomatic paediatric patients with mild disease.

The antibody levels in S/C ratios at the same time point were compared by the Mann-Whitney test, while the percentages of positive samples were compared by Fisher's Exact test. *P* values smaller than 0.05 are bolded, *p* values >0.9999 are represented by ns (not significant) while dashes mean no data for comparison.

A. Nasal epithelial lining fluid (NELF)

Days post diagnosis	IgA	0-4	5-9	12-16	19-23	26-30	83-99	169-197	Days post diagnosis	IgG	0-4	5-9	12-16	19-23	26-30	83-99	169-197
Adult patients	No. of sample	32	42	43	35	35	30	23	Adult patients	No. of sample	26	30	29	27	28	26	23
	n	13	17	18	15	14	10	8		n	10	10	10	10	9	8	7
Mild disease	Median ± IQR	0.3±1.7	1.1±4.0	3.4±5.5	4.7±6.7	5.9±8.5	1.1±4.2	1.7±3.9	Mild disease	Median ± IQR	0.1±0.1	0.1±0.1	0.1±1.0	0.2±0.2	0.6±0.8	0.1±0.3	0.1±0.1
	%	31	47	89	93	93	50	63		%	0	0	20	0	11	0	0
	n	13	17	17	13	12	11	8		n	10	12	11	10	10	9	9
Moderate disease	Median ± IQR	0.3±0.4	0.6±0.9	2.8±5.4	7.2±7.1	9.3±6.1	4.9±10.4	2.8±11.2	Moderate disease	Median ± IQR	0.1±0.0	0.1±0.1	0.1±0.2	0.2±1.0	0.4±2.5	0.2±0.4	0.1±0.2
	%	14	28	67	100	100	73	67		%	0	0	0	22	40	13	0
	n	6	8	8	7	9	9	7		n	6	8	8	7	9	9	7
Severe & critically ill	Median ± IQR	0.2±0.6	0.2±1.0	3.5±6.5	8.4±5.1	9.8±5.7	2.6±5.5	9.5±2.4	Severe & critically ill	Median ± IQR	0.1±0.1	0.1±0.02	0.3±0.8	0.5±2.8	0.5±3.1	0.7±0.9	0.2±0.9
	%	17	25	75	100	100	67	43		%	0	0	13	29	33	22	14
Dunn's multiple comparisons test	p-values								Dunn's multiple comparisons test	p-values							
Adult patients: mild disease vs moderate disease	0.9469	0.4095	0.7753	0.1974	0.6076	0.3648	ns		Adult patients: mild disease vs moderate disease	ns	ns	ns	0.931	ns	ns	ns	
Adult patients: mild disease vs severe & critically ill	0.3959	0.1715	ns	0.3957	0.8992	ns	ns		Adult patients: mild disease vs severe & critically ill	0.0751	0.0249	ns	0.0221	ns	ns	0.1921	
Adult patients: mild disease vs severe & critically ill	ns	ns	ns	ns	ns	ns	ns		Adult patients: mild disease vs severe & critically ill	0.3243	0.0461	ns	0.2357	ns	ns	0.2809	
Fisher's Exact test between groups	p-values								Fisher's Exact test between groups	p-values							
Adult patients: mild disease vs moderate disease	0.6447	0.2818	0.2285	ns	ns	0.3870	ns		Adult patients: mild disease vs moderate disease	ns	ns	0.2143	0.4737	0.3034	ns	ns	
Adult patients: mild disease vs severe & critically ill	ns	0.4018	0.5633	ns	ns	0.6499	0.6193		Adult patients: mild disease vs severe & critically ill	ns	ns	ns	0.1544	0.5765	0.4706	ns	
Adult patients: mild disease vs severe & critically ill	ns	ns	ns	ns	ns	ns	0.6193		Adult patients: mild disease vs severe & critically ill	ns	ns	0.4211	ns	ns	ns	0.4375	

B. Plasma

Days post diagnosis	IgA	0-4	5-9	12-16	19-23	26-30	83-99	169-197	Days post diagnosis	IgG	0-4	5-9	12-16	19-23	26-30	83-99	169-197
Adult patients	No. of sample	19	23	13	4	0	1	0	Adult patients	No. of sample	19	23	13	4	0	1	0
	n	7	8	4	1	0	1	0		n	7	8	4	1	0	1	0
Mild disease	Median ± IQR	0.2±0.3	2.2±4.9	2.9±7.3	8.2	-	2.4	-	Mild disease	Median ± IQR	0.1±0.0	0.3±0.7	1.5±1.8	10.8	-	1.1	-
	%	14	63	75	100	-	100	-		%	0	13	75	100	-	0	-
	n	10	9	4	3	-	-	-		n	10	9	4	3	-	-	-
Moderate disease	Median ± IQR	0.2±0.3	0.3±3.0	2.9±4.2	9.5±4.3	-	-	-	Moderate disease	Median ± IQR	0.1±0.0	0.1±1.7	0.2±1.0	5.2±6.3	-	-	-
	%	0	22	75	100	-	-	-		%	0	22	25	100	-	-	-
	n	2	6	5	-	-	-	-		n	2	6	5	-	-	-	-
Severe & critically ill	Median ± IQR	0.2±0.1	0.2±0.2	14.9±13.4	-	-	-	-	Severe & critically ill	Median ± IQR	0.1±0.0	0.1±0.0	7.3±9.9	-	-	-	-
	%	0	0	80	-	-	-	-		%	0	0	60	-	-	-	-
Dunn's multiple comparisons test	p-values								Dunn's multiple comparisons test	p-values							
Adult patients: mild disease vs moderate disease	ns	0.2657	ns	-	-	-	-		Adult patients: mild disease vs moderate disease	0.3689	0.6938	0.4390	-	-	-	-	
Adult patients: mild disease vs severe & critically ill	ns	0.0476	0.7271	-	-	-	-		Adult patients: mild disease vs severe & critically ill	0.9629	ns	ns	-	-	-	-	
Adult patients: mild disease vs severe & critically ill	ns	ns	0.8495	-	-	-	-		Adult patients: mild disease vs severe & critically ill	ns	ns	0.1334	-	-	-	-	
Fisher's Exact test between groups	p-values								Fisher's Exact test between groups	p-values							
Adult patients: mild disease vs moderate disease	0.4118	0.1534	ns	ns	-	-	-		Adult patients: mild disease vs moderate disease	ns	ns	0.4857	ns	-	-	-	
Adult patients: mild disease vs severe & critically ill	ns	0.0310	ns	-	-	-	-		Adult patients: mild disease vs severe & critically ill	ns	ns	ns	-	-	-	-	
Adult patients: mild disease vs severe & critically ill	ns	0.4857	ns	-	-	-	-		Adult patients: mild disease vs severe & critically ill	ns	ns	0.5238	-	-	-	-	

Table S2. Comparisons of the SARS-CoV-2 S1-specific antibody levels between adult patients of different disease severity. The antibody levels in S/C ratios at the same time point were compared by the Kruskal-Wallis test followed by Dunn's multiple comparison, while the percentages of positive samples were compared by Fisher's Exact test. P values smaller than 0.05 are bolded, p values >0.9999 are represented by ns (not significant) while dashes mean no data for compa

	Paediatrics	Adult all	Adult 1	Adult 2	Adult 3+4
	n = 20	n = 43	n = 17	n = 15	n = 11
Day between symptom onset and diagnosis (median \pm IQR)	0 \pm 1	-1 \pm 3	-1 \pm 2	-2 \pm 2	-2 \pm 3

Table S3: The median and interquartile range of the period between onset of symptoms and day of diagnosis.

Negative median means the symptoms had started before the PCR positive laboratory-based diagnosis.

Days post diagnosis	Paediatric patients				Adult patients					
	Asymptomatic		Symptomatic		Mild disease		Moderate disease		Severe/critically ill	
	n	Median \pm IQR	n	Median \pm IQR	n	Median \pm IQR	n	Median \pm IQR	n	Median \pm IQR
0	8	34.0 \pm 6.2	11	18.3 \pm 5.6	4	17.7 \pm 4.1	5	18.7 \pm 14.5	3	21.7 \pm 9.0
1	7	34.0 \pm 5.1	8	21.5 \pm 14.6	5	22.6 \pm 10.2	4	22.4 \pm 10.4	1	20.2 \pm 0
2	0	-	5	20.7 \pm 4.5	6	17.8 \pm 8.9	1	24.1 \pm 0	2	23.6 \pm 16.4
3	9	31.4 \pm 10.6	3	33.2 \pm 6.4	3	27.9 \pm 10.7	9	18.2 \pm 9.0	2	22.3 \pm 5.2
4	5	35.0 \pm 6.1	3	31.1 \pm 18.1	3	23.8 \pm 11.1	5	22.1 \pm 8.9	2	24.3 \pm 15.5
5	9	35.0 \pm 7.1	10	30.5 \pm 7.4	3	27.2 \pm 11.7	6	23.2 \pm 12.7	3	35.0 \pm 15.8
6	5	35.4 \pm 10.0	6	31.1 \pm 8.0	4	29.3 \pm 6.8	4	26.1 \pm 9.5	6	21.4 \pm 8.5
7	3	40.0 \pm 7.1	9	32.7 \pm 11.2	7	27.0 \pm 18.4	1	23.0 \pm 0	2	18.7 \pm 1.6
8	2	33.8 \pm 12.3	8	37.5 \pm 9.4	7	35.0 \pm 16.3	8	28.3 \pm 11.2	6	26.3 \pm 7.7
9	4	40 \pm 0	9	35.0 \pm 9.4	4	30.4 \pm 17.4	4	35.0 \pm 1.4	1	24.4 \pm 0
10	4	40 \pm 3.8	6	30.0 \pm 6.2	2	37.5 \pm 5.0	4	33.9 \pm 8.3	3	30.0 \pm 9.8
11	1	35.0 \pm 0	4	35.0 \pm 5.2	5	31.4 \pm 8.6	3	32.6 \pm 6.1	3	30.6 \pm 9.5
12	2	35.0 \pm 10.1	7	31.8 \pm 5.1	1	40 \pm 0	3	30.9 \pm 9.3	2	26.9 \pm 3.5
13	1	40 \pm 0	2	35.0 \pm 0	3	35.0 \pm 18.3	5	35.0 \pm 11.3	3	23.7 \pm 12.4
14	-	-	5	35.0 \pm 3.1	4	34.2 \pm 6.0	4	34.8 \pm 10.1	1	40 \pm 0
15	2	37.5 \pm 5.0	4	37.5 \pm 5.0	3	34.2 \pm 17.0	2	37.3 \pm 5.4	4	29.4 \pm 6.4
16	1	35 \pm 0	6	35.0 \pm 5.6	1	35.0 \pm 0	3	25.6 \pm 2.5	2	25.8 \pm 4.3
17	-	-	2	36.3 \pm 7.4	1	31.1 \pm 0	-	-	1	22.9 \pm 0
18	-	-	2	30.1 \pm 6.4	-	-	2	36.1 \pm 7.8	3	29.7 \pm 1.5
19	-	-	1	40 \pm 0	1	37.6 \pm 0	1	40 \pm 0	3	27.5 \pm 7.0
20	-	-	-	-	1	33.7 \pm 0	1	27.9 \pm 0	2	31.4 \pm 3.6
21	-	-	-	-	-	-	0	-	3	30.9 \pm 14.8
22	-	-	-	-	-	-	0	-	2	36.2 \pm 7.7
23	-	-	-	-	-	-	1	27.4 \pm 0	1	27.9 \pm 0
24	-	-	-	-	-	-	0	-	1	29.2 \pm 0
25	-	-	-	-	-	-	1	40 \pm 0	1	29.5 \pm 0
26	-	-	-	-	-	-	1	35.0 \pm 0	1	30.0 \pm 0

Table S4: The number of specimen (n) and the median and interquartile range (IQR) of the CT values of the corresponding patient group on each day.

Patients	Comorbidities
1	Hypertension (HT), Hx of cerebrovascular accident, Bipolar Affective Disorder, Alcoholism
2	Diabetes mellitus (DM), HT, Obese, Gout (Year 2010), Microalbuminuria, known obstructive sleep apnea (OSA) not on continuous positive airway pressure (CPAP)
3	Benign prostatic hyperplasia (BPH)
4	Hyperlipidaemia and Hypothyroidism
5	Atrial fibrillation with long pause
6	Non-ulcer dyspepsia, Helicobacter pylori eradication, Renal stone extracorporeal shock wave lithotripsy (ESWL) & surgery
7	DM, ruptured anterior communicating artery (ACoA) aneurysm with craniotomy and clipping done, pneumococcal meningitis in year 2015

Table S5: The comorbidities of the seven adult patients with severe COVID-19.