Comparative study of the clinical characteristics and epidemiological trend of 244 COVID-19 infected children with or without GI symptoms

Gastrointestinal (GI) symptoms[1 2] and positive stool severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) detection[3] have been reported in COVID-19 infected patients. However, these studies mainly focused on the adult population, and it is still not known whether children with COVID-19 have similar GI involvement.

We here report the clinical characteristics of 244 consecutive COVID-19 positive children from Wuhan, during the period 21 January to 20 March 2020. All were confirmed to have SARS-CoV-2 by reverse transcription-polymerase chain reaction (RT-PCR) on nasopharyngeal swabs. We specifically compared the differences between patients with and without GI symptoms (having at least one of the following: diarrhoea; nausea and vomiting; abdominal pain; and decreased feeding). In our cohort, 34 of 244 (13.9%) presented with GI symptoms on admission. These patients were much younger (14 vs 86 months; $p<0.05$), and more than half were under 3 years old.

For the clinical and laboratory parameters, patients with GI symptoms were more likely to have fever on admission (70.6% vs 35.7%, $p<0.05$) (table 1). No other significant differences were found between the two groups, including respiratory symptoms, the duration of RT-PCR positivity for COVID-19 and CT of the thorax.

Table 1 Epidemiological and clinical characteristics of COVID-19 children with or without GI symptoms

	GI symptoms (n=34)	Non-GI symptoms (n=210)	P value
Age (months)			
Median (IQR)	14 (3–93)	86 (28–139)	0.01*
Age group distribution (n (%))			0.02*
0–1 month	2 (5.9)	9 (4.3)	
1 month-12 months	14 (41.2)	30 (14.3)	
1–3 years old	4 (11.8)	23 (11.0)	
3–6 years old	3 (8.8)	24 (11.4)	
6–10 years old	5 (14.7)	61 (29.1)	
10–18 years old	6 (17.6)	63 (30.0)	
Sex (male) (n (%))	19 (55.9)	131 (62.4)	0.47
Birth weight (kg)	3.3 (2.9–3.7)	3.3 (3.0–3.6)	0.90
Clinical diagnostic classification (n (%))			0.47
Asymptomatic	0 (0)	51 (24.3)	<0.01*
Acute upper respiratory infection	7 (20.6)	43 (20.4)	
Mild pneumonia	25 (73.5)	107 (51.0)	
Severe pneumonia	0 (0)	7 (3.3)	
Critical pneumonia	2 (5.9)	2 (1.0)	
Contact history with infected family member	28 (79.4)	180 (85.7)	0.62
Symptoms (n (%))			
Fever	24 (70.6)	75 (35.7)	<0.01*
Vomit	23 (67.7)	–	
Diarrhoea	15 (44.1)	–	
Abdominal pain	4 (11.8)	–	
Decreased feeding	8 (23.5)	–	
Stool SARS-CoV-2 RT-PCR results (105 patients tested) (n (%))			
Positive	7/17 (41.2)	32/88 (36.4)	0.70

*denotes statistical significance.
SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

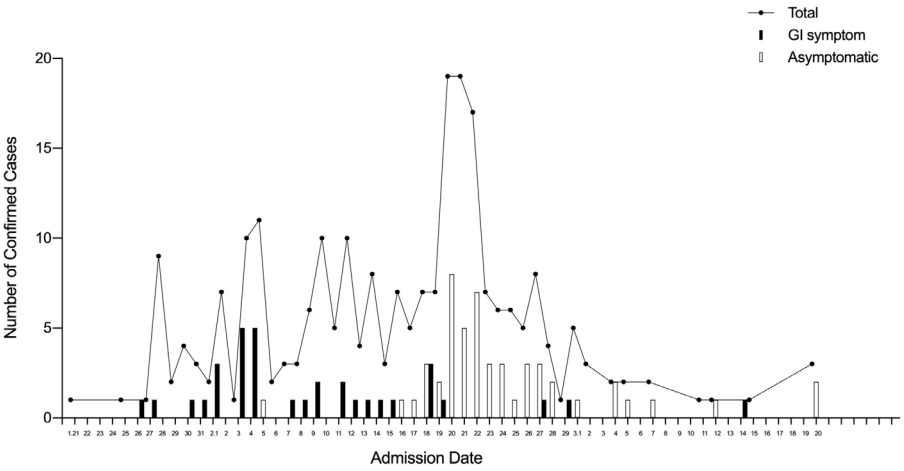

Figure 1 A graph showing the total number of paediatric patients (line), the number of patients admitted with GI symptoms (solid bar) and the number of patients admitted without GI symptoms (blank bar) infected with COVID-19 between 21st January to 20th March 2020.

One result of interest was the high positivity rate of stool SARS-CoV-2 RT-PCR for 105 patients tested, even in patients without any GI symptoms (7/17 (37.1%)) and those completely asymptomatic (6/18 (33.3%)). Using multivariate analysis, age and presence of fever were the only significant predictive factors for GI symptoms on admission.

When we plotted the whole cohort against admission dates (median admission date: 18th February), we found that more GI patients were admitted in the early period (26 vs 7; p<0.001). Conversely, patients admitted after 18 February were mostly asymptomatic (47 vs 4; p<0.001) (figure 1).

A percentage of 13.9 of our cohort presented with GI symptoms (11.6% in adults, 30% in one small paediatric study).[1 2 4 5] We also found that infants (younger than 2 years old) were more likely to present with GI symptoms than older children. The reason for this difference is not yet clear. Although our results support the findings by Jin *et al*[1] that GI symptoms were associated with fever, the presence of fever in children did not correlate with disease severity.

Previous reports suggested that the presence of GI symptoms in patients with COVID-19 meant the faecal–oral route could be a possible route of transmission.[5–7] We did not find any difference in faecal nucleic acid RT-PCR between children with or without GI symptoms. In fact, a high proportion of asymptomatic children were also found to have positive RT-PCR in stool. Our findings would therefore suggest RT-PCR detection of the virus was not due to gut infection but coming instead from the respiratory tract from swallowed sputum. Although detection of viral RNA without additional virological evidence does not necessarily imply infection and faecal–oral spread, live SARS-CoV-2 detected on electron microscopy in stool samples[8] and elevated concentrations of SARS-CoV-2 detected in patients' toilet areas[9] in recent reports mean that faecal–oral transmission remains a possibility. Contact precaution should be exercised in dealing with the excreta of patients with COVID-19, whether they have GI symptoms or not.

In contrast to adult series,[10 11] our study showed a downward trend of children presenting with GI symptoms over time. Furthermore, most of the children were infected via family contact (85.2%) rather than community acquired. As the epidemic progressed in Wuhan, more diagnostic tests done led to earlier disease detection through contact screening. This observation could be useful for public health planning in countries still experiencing the early stage of the pandemic. An increase in asymptomatic infections also means the public should remain on guard at all times.

Xiao-li Xiong,[1] Kenneth Kak-yuen Wong ,[2] Shui-qing Chi,[3] Ai-fen Zhou,[4] Jian-qiao Tang,[1] Li-shan Zhou,[1] Patrick Ho-yu Chung,[2] Gilbert Chua ,[5] Ketih Tung,[5] Ian Wong,[6,7] Celine Chui,[6] Xue Li,[6] Mike Yat-wah Kwan,[8] Wilfred Hing-sang Wong,[5] Marco Hok-kung Ho,[5] Godfrey Chi-fung Chan,[5] Guo-qing Cao,[3] Kang Li,[3] Patrick Ip,[5] Peng Chen,[9] Shao-tao Tang,[3] Paul Kwong-hang Tam[2,10]

[1]Department of Integrated Chinese and Western Medicine, Wuhan Children's Hospital (Wuhan Maternal and Child Healthcare Hospital), Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China
[2]Department of Surgery, University of Hong Kong, Hong Kong, Hong Kong
[3]Department of Paediatric Surgery, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China
[4]Department of Maternal Healthcare, Wuhan Children's Hospital (Wuhan Maternal and Child Healthcare Hospital), Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China
[5]Department of Paediatrics and Adolescent Medicine, LKS Faculty of Medicine, The University of Hong Kong, Hong Kong, Hong Kong
[6]Department of Pharmacology and Pharmacy, University of Hong Kong, Hong Kong, Hong Kong
[7]Research Department of Practice and Policy, UCL School of Parmacy, University College, London, United Kingdom
[8]Department of Paediatrics, Princess Margaret Hospital, Hong Kong, Hong Kong
[9]Department of Respiratory Medicine, Wuhan Children's Hospital (Wuhan Maternal and Child Healthcare Hospital), Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China
[10]Dr. Li Dak Sun Research Centre, University of Hong Kong, Hong Kong, HKSAR, China

Correspondence to Professor Paul Kwong-hang Tam, Surgery, University of Hong Kong, Hong Kong, Hong Kong; paultam@hku.hkDr Patrick Ip; patricip@hku.hkDr Peng Chen; longting2010@yeah.netProfessor Shao-tao Tang; tshaotao83@hust.edu.cn

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Twitter Kenneth Kak-yuen Wong @hk_kennethwong and Kang Li @xiaokang8290150@gmail.com

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ORCID iDs
Kenneth Kak-yuen Wong http://orcid.org/0000-0001-7371-503X
Gilbert Chua http://orcid.org/0000-0003-0333-0059

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