symptomatic patients.[8] This limitation also applies to our population of liver transplant recipients—the total number who could be SARS-CoV-2 positive (but who remain asymptomatic or who have only mild symptoms, and who have thus not been tested), is not known. Nonetheless, given the short observation period (3 weeks) which we report here, the observed death rate is of concern.

We recognise the intrinsic limitations of this case series (ie, the small sample size, the unavailability of the exact number of COVID-19 positive patients, and the associated difficulty in accurately calculating the case-fatality rate) and the consequent urgent need of collecting data for further studies to draw more solid conclusions. However, according to this initial observation, we suggest that great attention is paid to long-term liver transplant recipients with metabolic comorbidities. In keeping with clinical insights from the American Association for the Study of Liver Diseases we suggest that immunosuppression should not be reduced or stopped in asymptomatic liver transplant recipients.[9]

We declare no competing interests.

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## SARS-CoV-2 in wastewater: potential health risk, but also data source

Since the first publications reporting the detection of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in faeces,[1] it became clear that human wastewater might contain the novel coronavirus. From Feb 17, 2020, onwards, we took 24-h 10 L samples once a week from human wastewater collected at Amsterdam Airport Schiphol (Haarlemmermeer, Netherlands) for virus analyses. Samples tested positive for virus RNA by quantitative RT-PCR methodology 4 days after the first cases of coronavirus disease 2019 (COVID-19) were identified in the Netherlands on Feb 27, 2020 (unpublished data). This could be explained by virus excretion from potentially symptomatic, asymptomatic, or presymptomatic individuals passing through the airport. Furthermore, human wastewater sampled near the first Dutch cases in Tilburg, Netherlands, also tested positive for the presence of viral RNA within a week of the first day of disease onset (unpublished data).[2] These findings indicate that wastewater could be a sensitive surveillance system and early warning tool, as was previously shown for poliovirus.[3] To our knowledge, this detection in the Netherlands is the first report of SARS-CoV-2 in wastewater.

Whether SARS-CoV-2 is viable under environmental conditions that could facilitate faecal–oral transmission is not yet clear. However, evidence exists of potential community spread, with the virus spreading easily and sustainably in the community in some affected geographic areas such as China.[4] A case has also been reported in the USA in which the individual had not been exposed to anyone known to be infected with SARS-CoV-2 and had not travelled to countries in which the virus is circulating.[5] Potential enteric transmission also has implications for those working with human waste and wastewater, for whom WHO guidance has been developed specifically in relation to COVID-19. Overall, the provision of safe water, sanitation, and hygienic conditions can offer protection from any infectious disease, including COVID-19.

Enteric transmission of SARS-CoV-2 is possible and exposure to SARS-CoV-2 in wastewater could pose a health risk. But environmental surveillance of SARS-CoV-2 could serve as a data source, indicating if the virus is circulating in the human population. Previously, this tool has been successfully applied for preclinical identification of Aichi virus.[6] The possibility of faecal–oral transmission of COVID-19 has implications, especially in areas with poor sanitation where diagnostic capacity might be limited, such as Africa. Wastewater surveillance, especially in areas with a scarcity of data, might be informative, as we have previously shown in monitoring antibiotic resistance on a global scale.[7]

AMdRH is Director of the WHO Collaborating Centre for Risk Assessment of Pathogens in Food and Water. WL and AMdRH declare no competing interests.

For the **WHO guidance on water, sanitation, hygiene and waste management** see https://www.who.int/publications-detail/water-sanitation-hygiene-and-waste-management-for-covid-19

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See Online for appendix

# Enteric involvement in hospitalised patients with COVID-19 outside Wuhan

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Early studies[1,2] of coronavirus disease 2019 (COVID-19) reported that the proportion of patients presenting with gastrointestinal symptoms was low. However, evidence for enteric involvement is emerging.[3-6] Recently, a multicentre study[7] in Hubei province (China) indicated that gastrointestinal symptoms were common in patients with COVID-19. We examined the intestinal symptoms of patients with COVID-19 from multiple medical centres located in and outside of Hubei province.

We retrospectively analysed data from 232 patients who were positive for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) RNA admitted to 14 hospitals (two hospitals in Guangdong province, two in Hubei province, and ten in Jiangxi province) between Jan 19, 2020, and March 6, 2020. Most patients were admitted because of fever, cough, dyspnoea, and chest CT findings consistent with COVID-19 pneumonia. Diagnosis of COVID-19 was based on positive SARS-CoV-2 RNA tests. Two patients with pre-existing digestive diseases were excluded from our analysis. The analysis was approved by the institutional review boards of Sun Yat-sen University and the participating hospitals. Full details of the methods used are in the appendix (p 1).

The clinical and demographic characteristics of the 230 patients analysed are shown in the appendix (p 2). There were 129 men and 101 women; median age was 47·5 years (range 7–90). The most common symptoms at onset of illness were fever (193 [84%] patients), cough (159 [69%] patients), and sputum production (98 [43%] patients). Diarrhoea was observed in 49 (21%) patients. Patients with diarrhoea were older and were more likely to have comorbidities than patients without diarrhoea (table). A greater proportion of patients admitted to hospital had diarrhoea as the outbreak progressed: nine (43%) of 21 patients admitted between Feb 12 and March 6, 2020, had diarrhoea versus 40 (19%) of 209 patients admitted between Jan 19 and Feb 11, 2020.

More patients with diarrhoea showed severe symptoms of pneumonia

| | With diarrhoea (n=49) | Without diarrhoea (n=181) | p value |
|---|---|---|---|
| Age, years | 55 (40–65) | 46 (36–57) | 0·017 |
| Sex | .. | .. | 0·87 |
| Male | 27 (55%) | 102 (56%) | .. |
| Female | 22 (45%) | 79 (44%) | .. |
| Any comorbidity | 19 (39%) | 39 (22%) | 0·017 |
| Date of admission to hospital | .. | .. | 0·022 |
| Jan 19–Feb 11, 2020 | 40 (82%) | 169 (93%) | .. |
| Feb 12–March 6, 2020 | 9 (18%) | 12 (7%) | .. |
| Severe COVID-19 disease | 26 (53%) | 35 (19%) | <0·0001 |
| Oxygen supplementation | 44 (90%) | 143 (79%) | 0·10 |
| Ventilatory support | 6 (12%) | 3 (2%) | 0·0036 |
| Intensive care | 15 (31%) | 20 (11%) | 0·0015 |
| Died | 4 (8%) | 2 (1%) | 0·020 |
| White blood cell count, $\times 10^9$ cells per L | 5·6 (2·0) | 5·6 (3·0) | 1·0 |
| Lymphocyte count, $\times 10^9$ cells per L | 1·0 (0·6) | 1·1 (0·5) | 0·28 |
| Neutrophil count, $\times 10^9$ cells per L | 3·4 (1·8) | 3·9 (2·9) | 0·34 |
| Alanine aminotransferase, U/L | 37·9 (27·4) | 34·0 (24·4) | 0·36 |
| Aspartate aminotransferase, U/L | 39·3 (27·0) | 34·7 (17·9) | 0·19 |
| Total bilirubin, μmol/L | 12·5 (7·3) | 11·5 (5·9) | 0·36 |
| Activated partial thromboplastin time, s | 30·5 (9·5) | 31·0 (7·8) | 0·74 |
| D-dimer, mg/L | 1·0 (1·8) | 1·6 (5·4) | 0·48 |
| Procalcitonin, ng/mL | 0·29 (0·69) | 0·19 (0·36) | 0·25 |
| Erythrocyte sedimentation rate, mm/h | 40·7 (30·0) | 23·8 (18·7) | 0·0002 |
| C-reactive protein, mg/L | 40·5 (52·0) | 30·0 (38·3) | 0·16 |
| Antibiotics | 36 (73%) | 138 (76%) | 0·71 |
| Antiviral treatment | 49 (100%) | 180 (99%) | 1·0 |

Data are median (IQR), n (%), or mean (SD). p values comparing patients with and without diarrhoea were calculated by use of Fisher's exact test, Mann–Whitney *U* test, or Student's *t* test. COVID-19=coronavirus disease 2019.

***Table 1:* Demographic and clinical characteristics of patients with COVID-19 with and without diarrhoea**