# Evidence Search Service Results of your search request

## Infectivity of different body fluids in patients with COVID-19

**ID of request:** 22986  
**Date of request:** 30th April, 2020  
**Date of completion:** 1st May, 2020

If you would like to request any articles or any further help, please contact:  Jason Curtis at [jason.curtis1@nhs.net](mailto:jason.curtis1@nhs.net)

Please acknowledge this work in any resulting paper or presentation as: Evidence search: Infectivity of different body fluids in patients with COVID-19. Jason Curtis. ( 1st May, 2020). SHREWSBURY, UK: Shrewsbury and Telford Health Libraries.

**Sources searched**  
EMBASE (1)  
MEDLINE (17)  
UpToDate (1)

**Date range used** (5 years, 10 years): 2019 -   
**Limits used** (gender, article/study type, etc.): English-language only   
**Search terms and notes** (full search strategy for database searches below):

Relevant natural language and controlled vocabulary terms were selected and combined. Final result sets were de-duplicated and reviewed for relevance by the searcher, irrelevant results being discarded.

Searched: Medline, EMBASE, UpToDate, CEBM

Relevant references from UpToDate checked and added.

For more information about the resources please go to: <http://www.library.sath.nhs.uk/>.

## Contents

[A. Synopses or Summaries](#Content2)

UpToDate

[Coronavirus disease 2019 (COVID-19): Epidemiology, virology, clinical features, diagnosis, and prevention](#Research637067)

[B. Original Research](#Content5)

1. [Characteristics of Ocular Findings of Patients With Coronavirus Disease 2019 (COVID-19) in Hubei Province, China.](#Research637054)
2. [Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records](#Research637058)
3. [Coronavirus Disease 2019: Coronaviruses and Blood Safety.](#Research637049)
4. [Detectable 2019-nCoV viral RNA in blood is a strong indicator for the further clinical severity.](#Research637062)
5. [Detection of SARS-CoV-2 in Different Types of Clinical Specimens.](#Research637060)
6. [Epidemiologic Features and Clinical Course of Patients Infected With SARS-CoV-2 in Singapore.](#Research637048)
7. [Gastrointestinal Manifestations of SARS-CoV-2 Infection and Virus Load in Fecal Samples from the Hong Kong Cohort and Systematic Review and Meta-analysis.](#Research637051)
8. [Isolation of Infectious SARS-CoV-2 from Urine of a COVID-19 Patient.](#Research637056)
9. [Management of COVID-19 Related Paediatric Blood Samples in a Clinical Haematology Laboratory.](#Research637057)
10. [Positive result of Sars-Cov-2 in faeces and sputum from discharged patient with COVID-19 in Yiwu, China.](#Research637053)
11. [Prolonged viral shedding in feces of pediatric patients with coronavirus disease 2019.](#Research637047)
12. [Quantitative Detection and Viral Load Analysis of SARS-CoV-2 in Infected Patients.](#Research637064)
13. [Review article: gastrointestinal features in COVID-19 and the possibility of faecal transmission.](#Research637055)
14. [Saliva: potential diagnostic value and transmission of 2019-nCoV.](#Research637052)
15. [SARS-CoV-2 Isolation From Ocular Secretions of a Patient With COVID-19 in Italy With Prolonged Viral RNA Detection.](#Research637061)
16. [The presence of SARS-CoV-2 RNA in the feces of COVID-19 patients.](#Research637046)
17. [Viral load dynamics and disease severity in patients infected with SARS-CoV-2 in Zhejiang province, China, January-March 2020: retrospective cohort study.](#Research637063)
18. [Virological assessment of hospitalized patients with COVID-2019.](#Research637050)

### [C. Search History](#SearchHistory)

## A. Synopses or Summaries

#### UpToDate

**Coronavirus disease 2019 (COVID-19): Epidemiology, virology, clinical features, diagnosis, and prevention** (2020)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=a78ef275d8d795505ef6a6a680a971e4)

See section on 'Route of person-to-person transmission'

## B. Original Research

1. **Characteristics of Ocular Findings of Patients With Coronavirus Disease 2019 (COVID-19) in Hubei Province, China.**  
   Wu Ping JAMA ophthalmology 2020;:No page numbers.

ImportanceWhile the outbreak of coronavirus disease 2019 (COVID-19) has resulted in more than 100 000 infected individuals in China and worldwide, there are few reports on the association of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) with ocular abnormalities. Understanding ocular manifestations of patients with COVID-19 by ophthalmologists and others may facilitate the diagnosis and prevention of transmission of the disease.ObjectiveTo investigate ocular manifestations and viral prevalence in the conjunctiva of patients with COVID-19.Design, Setting, and ParticipantsIn this case series, patients with COVID-19 treated from February 9 to 15, 2020, at a hospital center in Hubei province, China, were retrospectively reviewed for ocular manifestations. During the period of treatment, the ocular signs and symptoms as well as results of blood tests and reverse transcriptase-polymerase chain reaction (RT-PCR) from nasopharyngeal and conjunctival swabs for SARS-CoV-2 were noted and analyzed.Main Outcomes and MeasuresOcular signs and symptoms as well as results of blood tests and RT-PCR for SARS-CoV-2.ResultsOf the 38 included patients with clinically confirmed COVID-19, 25 (65.8%) were male, and the mean (SD) age was 65.8 (16.6) years. Among them, 28 patients (73.7%) had positive findings for COVID-19 on RT-PCR from nasopharyngeal swabs, and of these, 2 patients (5.2%) yielded positive findings for SARS-CoV-2 in their conjunctival as well as nasopharyngeal specimens. A total of 12 of 38 patients (31.6%; 95% CI, 17.5-48.7) had ocular manifestations consistent with conjunctivitis, including conjunctival hyperemia, chemosis, epiphora, or increased secretions. By univariate analysis, patients with ocular symptoms were more likely to have higher white blood cell and neutrophil counts and higher levels of procalcitonin, C-reactive protein, and lactate dehydrogenase than patients without ocular symptoms. In addition, 11 of 12 patients with ocular abnormalities (91.7%; 95% CI, 61.5-99.8) had positive results for SARS-CoV-2 on RT-PCR from nasopharyngeal swabs. Of these, 2 (16.7%) had positive results for SARS-CoV-2 on RT-PCR from both conjunctival and nasopharyngeal swabs.Conclusions and RelevanceIn this study, one-third of patients with COVID-19 had ocular abnormalities, which frequently occurred in patients with more severe COVID-19. Although there is a low prevalence of SARS-CoV-2 in tears, it is possible to transmit via the eyes.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=62739a2e9c24b7744d8a9293f97330fa)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=d6e080927b78829bd2a7a86bb68621cf)

1. **Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records**  
   Chen H. The Lancet 2020;395(10226):809-815.

Background: Previous studies on the pneumonia outbreak caused by the 2019 novel coronavirus disease (COVID-19) were based on information from the general population. Limited data are available for pregnant women with COVID-19 pneumonia. This study aimed to evaluate the clinical characteristics of COVID-19 in pregnancy and the intrauterine vertical transmission potential of COVID-19 infection. <br/>Method(s): Clinical records, laboratory results, and chest CT scans were retrospectively reviewed for nine pregnant women with laboratory-confirmed COVID-19 pneumonia (ie, with maternal throat swab samples that were positive for severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2]) who were admitted to Zhongnan Hospital of Wuhan University, Wuhan, China, from Jan 20 to Jan 31, 2020. Evidence of intrauterine vertical transmission was assessed by testing for the presence of SARS-CoV-2 in amniotic fluid, cord blood, and neonatal throat swab samples. Breastmilk samples were also collected and tested from patients after the first lactation. <br/>Finding(s): All nine patients had a caesarean section in their third trimester. Seven patients presented with a fever. Other symptoms, including cough (in four of nine patients), myalgia (in three), sore throat (in two), and malaise (in two), were also observed. Fetal distress was monitored in two cases. Five of nine patients had lymphopenia (&lt;1.0 x 10 cells per L). Three patients had increased aminotransferase concentrations. None of the patients developed severe COVID-19 pneumonia or died, as of Feb 4, 2020. Nine livebirths were recorded. No neonatal asphyxia was observed in newborn babies. All nine livebirths had a 1-min Apgar score of 8-9 and a 5-min Apgar score of 9-10. Amniotic fluid, cord blood, neonatal throat swab, and breastmilk samples from six patients were tested for SARS-CoV-2, and all samples tested negative for the virus. <br/>Interpretation(s): The clinical characteristics of COVID-19 pneumonia in pregnant women were similar to those reported for non-pregnant adult patients who developed COVID-19 pneumonia. Findings from this small group of cases suggest that there is currently no evidence for intrauterine infection caused by vertical transmission in women who develop COVID-19 pneumonia in late pregnancy. <br/>Funding(s): Hubei Science and Technology Plan, Wuhan University Medical Development Plan.<br/>Copyright &#xa9; 2020 Elsevier Ltd

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=db1b618d36b1041f7804ddddd8f25347)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=98d4b13152282b185eadaf9eeb6f0ac6)

1. **Coronavirus Disease 2019: Coronaviruses and Blood Safety.**  
   Chang Le Transfusion medicine reviews 2020;:No page numbers.

With the outbreak of unknown pneumonia in Wuhan, China, in December 2019, a new coronavirus, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), aroused the attention of the entire world. The current outbreak of infections with SARS-CoV-2 is termed Coronavirus Disease 2019 (COVID-19). The World Health Organization declared COVID-19 in China as a Public Health Emergency of International Concern. Two other coronavirus infections-SARS in 2002-2003 and Middle East Respiratory Syndrome (MERS) in 2012-both caused severe respiratory syndrome in humans. All 3 of these emerging infectious diseases leading to a global spread are caused by β-coronaviruses. Although coronaviruses usually infect the upper or lower respiratory tract, viral shedding in plasma or serum is common. Therefore, there is still a theoretical risk of transmission of coronaviruses through the transfusion of labile blood products. Because more and more asymptomatic infections are being found among COVID-19 cases, considerations of blood safety and coronaviruses have arisen especially in endemic areas. In this review, we detail current evidence and understanding of the transmission of SARS-CoV, MERS-CoV, and SARS-CoV-2 through blood products as of February 10, 2020, and also discuss pathogen inactivation methods on coronaviruses.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=f0df4a955e55bfb101c10c7e6f8a5133)

1. **Detectable 2019-nCoV viral RNA in blood is a strong indicator for the further clinical severity.**  
   Chen Weilie Emerging microbes & infections 2020;9(1):469-473.

The novel coronavirus (2019-nCoV) infection caused pneumonia. we retrospectively analyzed the virus presence in the pharyngeal swab, blood, and the anal swab detected by real-time PCR in the clinical lab. Unexpectedly, the 2109-nCoV RNA was readily detected in the blood (6 of 57 patients) and the anal swabs (11 of 28 patients). Importantly, all of the 6 patients with detectable viral RNA in the blood cohort progressed to severe symptom stage, indicating a strong correlation of serum viral RNA with the disease severity (p-value = 0.0001). Meanwhile, 8 of the 11 patients with annal swab virus-positive was in severe clinical stage. However, the concentration of viral RNA in the anal swab (Ct value = 24 + 39) was higher than in the blood (Ct value = 34 + 39) from patient 2, suggesting that the virus might replicate in the digestive tract. Altogether, our results confirmed the presence of virus RNA in extra-pulmonary sites.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=959ce06ec0413d93e923bb59fa0533d4)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=796ee059d5bda65bc6552c09b71932cf)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=e4631422d7d54fd10ee1635d65591977)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=7fbe0a68a874b7952bc7f89c8b50c5e5)

1. **Detection of SARS-CoV-2 in Different Types of Clinical Specimens.**  
   Wang Wenling JAMA 2020;:No page numbers.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=e34e1290f9fcf9058f3b375e75753e4e)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=2a071438eeed63bdd4882055b24d1f31)

1. **Epidemiologic Features and Clinical Course of Patients Infected With SARS-CoV-2 in Singapore.**  
   Young Barnaby Edward JAMA 2020;:No page numbers.

ImportanceSevere acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged in Wuhan, China, in December 2019 and has spread globally with sustained human-to-human transmission outside China.ObjectiveTo report the initial experience in Singapore with the epidemiologic investigation of this outbreak, clinical features, and management.Design, Setting, and ParticipantsDescriptive case series of the first 18 patients diagnosed with polymerase chain reaction (PCR)-confirmed SARS-CoV-2 infection at 4 hospitals in Singapore from January 23 to February 3, 2020; final follow-up date was February 25, 2020.ExposuresConfirmed SARS-CoV-2 infection.Main Outcomes and MeasuresClinical, laboratory, and radiologic data were collected, including PCR cycle threshold values from nasopharyngeal swabs and viral shedding in blood, urine, and stool. Clinical course was summarized, including requirement for supplemental oxygen and intensive care and use of empirical treatment with lopinavir-ritonavir.ResultsAmong the 18 hospitalized patients with PCR-confirmed SARS-CoV-2 infection (median age, 47 years; 9 [50%] women), clinical presentation was an upper respiratory tract infection in 12 (67%), and viral shedding from the nasopharynx was prolonged for 7 days or longer among 15 (83%). Six individuals (33%) required supplemental oxygen; of these, 2 required intensive care. There were no deaths. Virus was detectable in the stool (4/8 [50%]) and blood (1/12 [8%]) by PCR but not in urine. Five individuals requiring supplemental oxygen were treated with lopinavir-ritonavir. For 3 of the 5 patients, fever resolved and supplemental oxygen requirement was reduced within 3 days, whereas 2 deteriorated with progressive respiratory failure. Four of the 5 patients treated with lopinavir-ritonavir developed nausea, vomiting, and/or diarrhea, and 3 developed abnormal liver function test results.Conclusions and RelevanceAmong the first 18 patients diagnosed with SARS-CoV-2 infection in Singapore, clinical presentation was frequently a mild respiratory tract infection. Some patients required supplemental oxygen and had variable clinical outcomes following treatment with an antiretroviral agent.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=2c485eb4d1b0f479735c4d07f5dcc51d)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=b21709f24ce445af29d07be6f1ec1749)

1. **Gastrointestinal Manifestations of SARS-CoV-2 Infection and Virus Load in Fecal Samples from the Hong Kong Cohort and Systematic Review and Meta-analysis.**  
   Cheung Ka Shing Gastroenterology 2020;:No page numbers.

BACKGROUND & AIMSInfection with SARS-CoV-2 causes COVID-19, which has been characterized by fever, respiratory, and gastrointestinal symptoms as well as shedding of virus RNA into feces. We performed a systematic review and meta-analysis of published gastrointestinal symptoms and detection of virus in stool, and also summarized data from a cohort of patients with COVID-19 in Hong Kong.METHODSWe collected data from the cohort of patients with COVID-19 in Hong Kong (n=59; diagnosis from February 2 through Feb 29, 2020), and searched PubMed, Embase, Cochrane and three Chinese databases through March 11, 2020 according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. We analyzed pooled data on the prevalence of overall and individual gastrointestinal symptoms (anorexia, nausea, vomiting, diarrhea, and abdominal pain or discomfort) using a random effects model.RESULTSAmong the 59 patients with COVID-19 in Hong Kong, 15 patients (25.4%) had gastrointestinal symptoms and 9 patients (15.3%) had stool that tested positive for virus RNA. Stool viral RNA was detected in 38.5% and 8.7% among those with and without diarrhea, respectively (P=.02). The median fecal viral load was 5.1 log10cpm in patients with diarrhea vs 3.9 log10cpm in patients without diarrhea (P=.06). In a meta-analysis of 60 studies, comprising 4243 patients, the pooled prevalence of all gastrointestinal symptoms was 17.6% (95% CI, 12.3%-24.5%); 11.8% of patients with non-severe COVID-19 had gastrointestinal symptoms (95% CI, 4.1%-29.1%) and 17.1% of patients with severe COVID-19 had gastrointestinal symptoms (95% CI, 6.9%-36.7%). In the meta-analysis, the pooled prevalence of stool samples that were positive for virus RNA was 48.1% (95% CI, 38.3%-57.9%); of these samples, 70.3% of those collected after loss of virus from respiratory specimens tested positive for the virus (95% CI, 49.6%-85.1%).CONCLUSIONSIn an analysis of data from the Hong Kong cohort of patients with COVID-19 and a meta-analysis of findings from publications, we found that 17.6% of patients with COVID-19 had gastrointestinal symptoms. Virus RNA was detected in stool samples from 48.1% patients-even in stool collected after respiratory samples tested negative. Healthcare workers should therefore exercise caution in collecting fecal samples or performing endoscopic procedures in patients with COVID-19-even during patient recovery.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=e9fcedad165522dc156401bb691e44d1)

1. **Isolation of Infectious SARS-CoV-2 from Urine of a COVID-19 Patient.**  
   Sun Jing Emerging microbes & infections 2020;:1-8.

SARS-CoV-2 caused a major outbreak of severe pneumonia (COVID-19) in humans. Viral RNA was detected in multiple organs in COVID-19 patients. However, infectious SARS-CoV-2 was only isolated from respiratory specimens. Here, infectious SARS-CoV-2 was successfully isolated from urine of a COVID-19 patient. The virus isolated could infect new susceptible cells and was recognized by its' own patient sera. Appropriate precautions should be taken to avoid transmission from urine.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=5db75a1e8709d1f47f41c24f01db929b)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=3abdc8e34b34fe6e95d2163d2196ed1a)

1. **Management of COVID-19 Related Paediatric Blood Samples in a Clinical Haematology Laboratory.**  
   Lam Joyce Ching Mei British journal of haematology 2020;:No page numbers.

There is currently limited knowledge about the transmission risks of the SARS-CoV-2 virus and its associated disease COVID-19 from routine clinical specimens. The first study to be published on the initial 41 cases of COVID-19 infections admitted in Wuhan detected SARS-CoV-2 RNA in the blood of 6/41 (15%) of patients (Huang et. al., 2020) . However, another study conducted on 1070 clinical specimens collected from confirmed COVID-19 patients in China showed the highest positive rates of SARS-CoV-2 from rRT-PCR testing of respiratory specimens such as bronchoalveolar lavage, sputum and nasopharyngeal swabs (32% - 93%). In contrast, only 1% of blood specimens and none of the urine specimens tested positive (Wang et. al., 2020).

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=aa2181415407173e42de38bb81a4123c)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=0723b61010121a65c47aef84346781f1)

1. **Positive result of Sars-Cov-2 in faeces and sputum from discharged patient with COVID-19 in Yiwu, China.**  
   Li Youjiang Journal of medical virology 2020;:No page numbers.

BACKGROUNDWith the effective prevention and control of COVID - 19 in China, the number of cured cases increased significantly. Further monitoring of the disease prognosis and effective control of the "relapse" of the epidemic become the next focus of work. To analyse the clinical prognosis of discharged COVID-19 patients by monitoring their SAR-CoV-2 nucleic acid status, which may provide evidence to establish discharge standards and follow-up management for COVID-19 patients.METHODSWe included 13 discharged COVID-19 patients who were quarantined for 4-week at home. The patient's daily clinical signs were recorded and sputum and faecal specimens were regularly sent for the detection of SARS-CoV-2 nucleic acid.RESULTSThe time between initial symptoms and meeting discharge criteria was 18 - 44 days with an average of 25 ± 6 days. The faecal samples of two patients still tested positive after meeting discharge criteria and the sputum samples of four patients returned positive 5 - 14 days after discharge. The rate of a recurring positive test result in samples from the respiratory system was 31%(4/13).CONCLUSIONUnder the present discharge criteria, the high presence of SARS-CoV-2 nucleic acid in faecal and respiratory samples of discharged COVID-19 patients indicate potential infectivity. Therefore, we suggest that faecal virus nucleic acid should be tested as a routine monitoring index for COVID-19 and a negative result be added to the criteria. Simultaneously, we should strengthen the regular follow-up of discharged patients with continuous monitoring of the recurrence of viral nucleic acid. This article is protected by copyright. All rights reserved.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=3991066b39870be3f97673e4547fc428)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=5016e30b67f0aee1f68558a03dba6280)

1. **Prolonged viral shedding in feces of pediatric patients with coronavirus disease 2019.**  
   Xing Yu-Han Journal of microbiology, immunology, and infection = Wei mian yu gan ran za zhi 2020;:No page numbers.

OBJECTIVETo determine the dynamic changes of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) RNA in respiratory and fecal specimens in children with coronavirus disease 2019 (COVID-19).METHODSFrom January 17, 2020 to February 23, 2020, three paediatric cases of COVID-19 were reported in Qingdao, Shandong Province, China. Epidemiological, clinical, laboratory, and radiological characteristics and treatment data were collected. Patients were followed up to March 10, 2020, and dynamic profiles of nucleic acid testing results in throat swabs and fecal specimens were closely monitored.RESULTSClearance of SARS-CoV-2 in respiratory tract occurred within two weeks after abatement of fever, whereas viral RNA remained detectable in stools of pediatric patients for longer than 4 weeks. Two children had fecal SARS-CoV-2 undetectable 20 days after throat swabs showing negative, while that of another child lagged behind for 8 days.CONCLUSIONSSARS-CoV-2 may exist in children's gastrointestinal tract for a longer time than respiratory system. Persistent shedding of SARS-CoV-2 in stools of infected children raises the possibility that the virus might be transmitted through contaminated fomites. Massive efforts should be made at all levels to prevent spreading of the infection among children after reopening of kindergartens and schools.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=2d0b7b69ac3d6e4d3b62c8558fb78524)

1. **Quantitative Detection and Viral Load Analysis of SARS-CoV-2 in Infected Patients.**  
   Yu Fengting Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 2020;:No page numbers.

BACKGROUNDCoronavirus disease 2019 (COVID-19) has become a public health emergency. The widely used reverse transcription PCR (RT-PCR) method has limitations for clinical diagnosis and treatment.METHODSA total of 323 samples from 76 COVID-19 confirmed patients were analyzed by droplet digital PCR (ddPCR) and RT-PCR based two target genes (ORF1ab and N). Nasal swabs, throat swabs, sputum, blood, and urine were collected. Clinical and imaging data were obtained for clinical staging.RESULTSIn 95 samples tested positive by both methods, the cycle threshold (Ct) of RT-PCR was highly correlated with the copy numbed of ddPCR (ORF1ab gene, R2 = 0.83; N gene, R2 = 0.87). 4 (4/161) negative and 41 (41/67) single-gene positive samples tested by RT-PCR were positive according to ddPCR with viral load ranging from 11.1 to 123.2 copies/test. Then the viral load of respiratory samples was compared and the average viral load in sputum (17429 ± 6920 copies/test) was found to be significantly higher than in throat swabs (2552 ± 1965 copies/test, p < 0.001) and nasal swabs (651 ± 501 copies/test, p < 0.001). Furthermore, the viral load in the early and progressive stages were significantly higher than that in the recovery stage (46800 ± 17272 vs 1252 ± 1027, p < 0.001) analyzed by sputum samples.CONCLUSIONSQuantitative monitoring of viral load in lower respiratory tract samples helps to evaluate disease progression, especially in cases of low viral load.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=736c6b1dff4aeaf6e0117a942ee0ea2c)

1. **Review article: gastrointestinal features in COVID-19 and the possibility of faecal transmission.**  
   Tian Yuan Alimentary pharmacology & therapeutics 2020;51(9):843-851.

BACKGROUNDThere is little published evidence on the gastrointestinal features of COVID-19.AIMSTo report on the gastrointestinal manifestations and pathological findings of patients with COVID-19, and to discuss the possibility of faecal transmission.METHODSWe have reviewed gastrointestinal features of, and faecal test results in, COVID-19 from case reports and retrospective clinical studies relating to the digestive system published since the outbreak.RESULTSWith an incidence of 3% (1/41)-79% (159/201), gastrointestinal symptoms of COVID-19 included anorexia 39.9% (55/138)-50.2% (101/201), diarrhoea 2% (2/99)-49.5% (146/295), vomiting 3.6% (5/138)-66.7% (4/6), nausea 1% (1/99)-29.4% (59/201), abdominal pain 2.2% (3/138)-6.0% (12/201) and gastrointestinal bleeding 4% (2/52)-13.7% (10/73). Diarrhoea was the most common gastrointestinal symptom in children and adults, with a mean duration of 4.1 ± 2.5 days, and was observed before and after diagnosis. Vomiting was more prominent in children. About 3.6% (5/138)-15.9% (32/201) of adult and 6.5% (2/31)-66.7% (4/6) of children patients presented vomiting. Adult and children patients can present with digestive symptoms in the absence of respiratory symptoms. The incidence of digestive manifestations was higher in the later than in the early stage of the epidemic, but no differences in digestive symptoms among different regions were found. Among the group of patients with a higher proportion of severe cases, the proportion of gastrointestinal symptoms in severe patients was higher than that in nonsevere patients (anorexia 66.7% vs 30.4%; abdominal pain 8.3% vs 0%); while in the group of patients with a lower severe rate, the proportion with gastrointestinal symptoms was similar in severe and nonsevere cases (nausea and vomiting 6.9% vs 4.6%; diarrhoea 5.8% vs 3.5%). Angiotensin converting enzyme 2 and virus nucleocapsid protein were detected in gastrointestinal epithelial cells, and infectious virus particles were isolated from faeces. Faecal PCR testing was as accurate as respiratory specimen PCR detection. In 36% (5/14)-53% (39/73) faecal PCR became positive, 2-5 days later than sputum PCR positive. Faecal excretion persisted after sputum excretion in 23% (17/73)-82% (54/66) patients for 1-11 days.CONCLUSIONSGastrointestinal symptoms are common in patients with COVID-19, and had an increased prevalence in the later stage of the recent epidemic in China. SARS-CoV-2 enters gastrointestinal epithelial cells, and the faeces of COVID-19 patients are potentially infectious.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=713439224501707a438187dec4f9049e)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=abc5e7b7be4977181e7e4da2f887208e)

1. **Saliva: potential diagnostic value and transmission of 2019-nCoV.**  
   Xu Ruoshi International journal of oral science 2020;12(1):11.

2019-nCoV epidemic was firstly reported at late December of 2019 and has caused a global outbreak of COVID-19 now. Saliva, a biofluid largely generated from salivary glands in oral cavity, has been reported 2019-nCoV nucleic acid positive. Besides lungs, salivary glands and tongue are possibly another hosts of 2019-nCoV due to expression of ACE2. Close contact or short-range transmission of infectious saliva droplets is a primary mode for 2019-nCoV to disseminate as claimed by WHO, while long-distance saliva aerosol transmission is highly environment dependent within indoor space with aerosol-generating procedures such as dental practice. So far, no direct evidence has been found that 2019-nCoV is vital in air flow for long time. Therefore, to prevent formation of infectious saliva droplets, to thoroughly disinfect indoor air and to block acquisition of saliva droplets could slow down 2019-nCoV dissemination. This review summarizes diagnostic value of saliva for 2019-nCoV, possibly direct invasion into oral tissues, and close contact transmission of 2019-nCoV by saliva droplets, expecting to contribute to 2019-nCoV epidemic control.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=b25cec9265ab27b3c9e7f578c759e166)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=36ef34dce2fe022321fe28f59b0c0f99)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=da3159f19367285c788c0c00c93bf625)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=82743e94a57f09420edfe1a32140d54e)

1. **SARS-CoV-2 Isolation From Ocular Secretions of a Patient With COVID-19 in Italy With Prolonged Viral RNA Detection.**  
   Colavita Francesca Annals of internal medicine 2020;:No page numbers.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=7d98e1b6e1c8e6fc0a9fa25ab385655f)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=c5593304a16e9af8cf691c94ec22ac19)

1. **The presence of SARS-CoV-2 RNA in the feces of COVID-19 patients.**  
   Chen Yifei Journal of medical virology 2020;:No page numbers.

In December 2019, coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), emerged in Wuhan, China, and has spread globally. However, the transmission route of SARS-CoV-2 has not been fully understood. In this study, we aimed to investigate SARS-CoV-2 shedding in the excreta of COVID-19 patients. Electronical medical records, including demographics, clinical characteristics, laboratory and radiological findings of enrolled patients were extracted and analyzed. Pharyngeal swab, stool, and urine specimens were collected and tested for SARS-CoV-2 RNA by real-time reverse transcription polymerase chain reaction. Viral shedding at multiple time points in specimens was recorded, and its correlation analyzed with clinical manifestations and the severity of illness. A total of 42 laboratory-confirmed patients were enrolled, 8 (19.05%) of whom had gastrointestinal symptoms. A total of 28 (66.67%) patients tested positive for SARS-CoV-2 RNA in stool specimens, and this was not associated with the presence of gastrointestinal symptoms and the severity of illness. Among them, 18 (64.29%) patients remained positive for viral RNA in the feces after the pharyngeal swabs turned negative. The duration of viral shedding from the feces after negative conversion in pharyngeal swabs was 7 (6-10) days, regardless of COVID-19 severity. The demographics, clinical characteristics, laboratory and radiologic findings did not differ between patients who tested positive and negative for SARS-CoV-2 RNA in the feces. Viral RNA was not detectable in urine specimens from 10 patients. Our results demonstrated the presence of SARS-CoV-2 RNA in the feces of COVID-19 patients and suggested the possibility of SARS-CoV-2 transmission via the fecal-oral route.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=dadb3bfa58ab08070ba736cd7a89f997)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=19b747a3c6472a129925e466e797aed0)

1. **Viral load dynamics and disease severity in patients infected with SARS-CoV-2 in Zhejiang province, China, January-March 2020: retrospective cohort study.**  
   Zheng Shufa BMJ (Clinical research ed.) 2020;369:m1443.

OBJECTIVETo evaluate viral loads at different stages of disease progression in patients infected with the 2019 severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) during the first four months of the epidemic in Zhejiang province, China.DESIGNRetrospective cohort study.SETTINGA designated hospital for patients with covid-19 in Zhejiang province, China.PARTICIPANTS96 consecutively admitted patients with laboratory confirmed SARS-CoV-2 infection: 22 with mild disease and 74 with severe disease. Data were collected from 19 January 2020 to 20 March 2020.MAIN OUTCOME MEASURESRibonucleic acid (RNA) viral load measured in respiratory, stool, serum, and urine samples. Cycle threshold values, a measure of nucleic acid concentration, were plotted onto the standard curve constructed on the basis of the standard product. Epidemiological, clinical, and laboratory characteristics and treatment and outcomes data were obtained through data collection forms from electronic medical records, and the relation between clinical data and disease severity was analysed.RESULTS3497 respiratory, stool, serum, and urine samples were collected from patients after admission and evaluated for SARS-CoV-2 RNA viral load. Infection was confirmed in all patients by testing sputum and saliva samples. RNA was detected in the stool of 55 (59%) patients and in the serum of 39 (41%) patients. The urine sample from one patient was positive for SARS-CoV-2. The median duration of virus in stool (22 days, interquartile range 17-31 days) was significantly longer than in respiratory (18 days, 13-29 days; P=0.02) and serum samples (16 days, 11-21 days; P<0.001). The median duration of virus in the respiratory samples of patients with severe disease (21 days, 14-30 days) was significantly longer than in patients with mild disease (14 days, 10-21 days; P=0.04). In the mild group, the viral loads peaked in respiratory samples in the second week from disease onset, whereas viral load continued to be high during the third week in the severe group. Virus duration was longer in patients older than 60 years and in male patients.CONCLUSIONThe duration of SARS-CoV-2 is significantly longer in stool samples than in respiratory and serum samples, highlighting the need to strengthen the management of stool samples in the prevention and control of the epidemic, and the virus persists longer with higher load and peaks later in the respiratory tissue of patients with severe disease.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=552a15261b52dcec6c64c77ea2e69f86)

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=7552280a03226fd41dd2f9fe6875c693)

1. **Virological assessment of hospitalized patients with COVID-2019.**  
   Wölfel Roman Nature 2020;:No page numbers.

Coronavirus disease 2019 (COVID-19) is an acute respiratory tract infection that emerged in late 20191,2. Initial outbreaks in China involved 13.8% cases with severe, and 6.1% with critical courses3. This severe presentation corresponds to the usage of a virus receptor that is expressed predominantly in the lung2,4. By causing an early onset of severe symptoms, this same receptor tropism is thought to have determined pathogenicity, but also aided the control, of severe acute respiratory syndrome (SARS) in 20035. However, there are reports of COVID-19 cases with mild upper respiratory tract symptoms, suggesting the potential for pre- or oligosymptomatic transmission6-8. There is an urgent need for information on body site-specific virus replication, immunity, and infectivity. Here we provide a detailed virological analysis of nine cases, providing proof of active virus replication in upper respiratory tract tissues. Pharyngeal virus shedding was very high during the first week of symptoms (peak at 7.11 × 108 RNA copies per throat swab, day 4). Infectious virus was readily isolated from throat- and lung-derived samples, but not from stool samples, in spite of high virus RNA concentration. Blood and urine never yielded virus. Active replication in the throat was confirmed by viral replicative RNA intermediates in throat samples. Sequence-distinct virus populations were consistently detected in throat and lung samples from the same patient, proving independent replication. Shedding of viral RNA from sputum outlasted the end of symptoms. Seroconversion occurred after 7 days in 50% of patients (14 days in all), but was not followed by a rapid decline in viral load. COVID-19 can present as a mild upper respiratory tract illness. Active virus replication in the upper respiratory tract puts the prospects of COVID-19 containment in perspective.

[Available online at this link](https://www.knowledgeshare.nhs.uk/index.php?PageID=link_resolver&link=1c0d823e7bd9c757f948e7e708a1f22d)

### Opening Internet Links

The links to internet sites in this document are 'live' and can be opened by holding down the CTRL key on your keyboard while clicking on the web address with your mouse

### Full text papers

Links are given to full text resources where available. For some of the papers, you will need an **NHS OpenAthens Account**. If you do not have an account you can [register online](https://openathens.nice.org.uk/).

You can then access the papers by simply entering your username and password. If you do not have easy access to the internet to gain access, please let us know and we can download the papers for you.

### Guidance on searching within online documents

Links are provided to the full text of each document. Relevant extracts have been copied and pasted into these results. Rather than browse through lengthy documents, you can search for specific words as follows:

**Portable Document Format / pdf / Adobe**  
Click on the Search button (illustrated with binoculars). This will open up a search window. Type in the term you need to find and links to all of the references to that term within the document will be displayed in the window. You can jump to each reference by clicking it.

**Word documents**  
Select Edit from the menu, the Find and type in your term in the search box which is presented. The search function will locate the first use of the term in the document. By pressing 'next' you will jump to further references.

## C. Search History

|  | **Source** | **Criteria** | **Results** |
| --- | --- | --- | --- |
| 1. | Medline | exp CORONAVIRUS/ | 12178 |
| 2. | Medline | exp "CORONAVIRUS INFECTIONS"/ | 10589 |
| 3. | Medline | (coronavirus OR "corona virus" OR covid19 OR covid-19 OR wuhan OR hubei OR "novel coronavirus" OR "2019-nCoV" OR "SARS-Cov").ti,ab | 19704 |
| 4. | Medline | (1 OR 2 OR 3) | 29453 |
| 5. | Medline | (infectivity OR pathogenicity OR transmission).ti,ab | 414219 |
| 14. | Medline | ((virus OR viral) ADJ2 shed\*).ti,ab | 4803 |
| 15. | Medline | (infection ADJ2 risk).ti,ab | 39720 |
| 7. | Medline | exp "FLUIDS AND SECRETIONS"/ | 2569388 |
| 9. | Medline | (urine OR blood OR sweat OR tears OR mucous OR faeces OR faecal OR fecal OR feces OR sputum OR saliva OR semen OR breastmilk OR "breast milk").ti,ab | 2209808 |
| 13. | Medline | ((ocular ADJ2 fluid\*) OR (pleural ADJ2 fluid\*)).ti,ab | 7518 |
| 16. | Medline | (5 OR 14 OR 15) | 451904 |
| 17. | Medline | (7 OR 9 OR 13) | 4296490 |
| 18. | Medline | (4 AND 16 AND 17) | 600 |
| 21. | Medline | ANIMALS/ NOT (HUMANS/ AND ANIMALS/) | 4652483 |
| 22. | Medline | 18 NOT 21 | 345 |
| 23. | Medline | 22 [DT FROM 2019] | 131 |
| 24. | EMBASE | exp CORONAVIRUS/ | 14063 |
| 25. | EMBASE | exp "CORONAVIRUS INFECTIONS"/ | 12351 |
| 26. | EMBASE | (coronavirus OR "corona virus" OR covid19 OR covid-19 OR wuhan OR hubei OR "novel coronavirus" OR "2019-nCoV" OR "SARS-Cov").ti,ab | 23022 |
| 27. | EMBASE | (24 OR 25 OR 26) | 33561 |
| 28. | EMBASE | (infectivity OR pathogenicity OR transmission).ti,ab | 459585 |
| 29. | EMBASE | ((virus OR viral) ADJ2 shed\*).ti,ab | 4778 |
| 30. | EMBASE | (infection ADJ2 risk).ti,ab | 29646 |
| 31. | EMBASE | (28 OR 29 OR 30) | 489104 |
| 33. | EMBASE | (urine OR blood OR sweat OR tears OR mucous OR faeces OR faecal OR fecal OR feces OR sputum OR saliva OR semen OR breastmilk OR "breast milk").ti,ab | 2955399 |
| 34. | EMBASE | ((ocular ADJ2 fluid\*) OR (pleural ADJ2 fluid\*)).ti,ab | 10740 |
| 35. | EMBASE | exp "BODY FLUIDS AND SECRETIONS"/ | 2774030 |
| 36. | EMBASE | (33 OR 34 OR 35) | 4781275 |
| 37. | EMBASE | (27 AND 31 AND 36) | 690 |
| 38. | EMBASE | ANIMAL/ NOT (HUMAN/ AND ANIMAL/) | 1064954 |
| 39. | EMBASE | 37 NOT 38 | 576 |
| 40. | EMBASE | 39 [DT 2019-2020] | 168 |

**Disclaimer**  
We hope that you find the evidence search service useful. Whilst care has been taken in the selection of the materials included in this evidence search, the Library and Knowledge Service is not responsible for the content or the accuracy of the enclosed research information. Accordingly, whilst every endeavour has been undertaken to execute a comprehensive search of the literature, the Library and Knowledge Service is not and will not be held responsible or liable for any omissions to pertinent research information not included as part of the results of the enclosed evidence search. Users are welcome to discuss the evidence search findings with the librarian responsible for executing the search. We welcome suggestions on additional search strategies / use of other information resources for further exploration. You must not use the results of this search for commercial purposes. Any usage or reproduction of the search output should acknowledge the Library and Knowledge Service that produced it.