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## Correspondence



## Characteristics and implications of Omicron variant associated digestive system infections – Correspondence

*Dar Editor,*

South Africa first reported to the World Health Organization (WHO) the latest variant B.1.1.529 of SARS-CoV-2 in late November 2021. When compared with the other SARS-CoV-2 variants, the new variant carries a higher risk of infection and spreads faster, and was named by the WHO as “Omicron” [1]. Since then, the Omicron variant BA.1 has been spreading rapidly worldwide, surpassing the previously dominant Delta variant [2]. Another variant of Omicron BA.2 was detected at the same time in several countries and regions, and its transmission ability even surpasses that of the variant BA.1. The effective reproduction number of the mutant BA.2 is 1.4 times that of the mutant BA.1, and the immunity induced by the currently available SARS-CoV-2 vaccines in the general population is ineffective against the mutant BA.2 in neutralization experiments [3]. Two other sub-variants of Omicron BA.4 and BA.5 have replaced BA.2 as the dominant strains in South Africa in the beginning of May 2022, and their transmission ability further increased. This Letter to Editor addresses the clinical characteristics and implications of digestive tract infection of the Omicron variant strains.

### 1. Pathogenic characteristics and clinical symptoms of Omicron variant infection

A new round of local SARS-CoV-2 outbreaks has occurred in Shanghai, China since late February 2022, and the virus genomes belong to the BA.2 variant of Omicron [4]. The cumulative number of infected people had reached more than 650,000 by late May 2022, and asymptomatic infection cases accounted for more than 90% of the total infected population. Deaths associated with this round of epidemic occurred mainly in elderly people over 60 years of age with a variety of serious underlying diseases and who had not been vaccinated or not fully vaccinated. All these show that the BA.2 variant of Omicron is very harmful to these elderly and also to children with weak immunity [3]. The most important way to curb asymptomatic infection of the Omicron variant strains is to cut off the chain of community transmission, and the Shanghai Government established several makeshift hospitals in various administrative regions to receive asymptotically infected patients for isolation and treatment. The mean time for nucleic acid negative conversion is about 5–7 days. There is no specific symptom in the early stage of the disease. Mild upper respiratory tract irritation occurs 12–72 hours later, mainly presenting as sore throat and hoarseness. Gastrointestinal symptoms are rare. A prospective observational study which involved more than 60,000 SARS-CoV-2 patients in the United Kingdom showed patients infected with the Omicron variant were less likely to develop nasal congestion (hyposmia) than the Delta variant, while sore throat and hoarseness were more common. Complications of other organs such as gastrointestinal symptoms were relatively rare [2]. The possible

reason for the strong transmissibility and mild symptoms of the Omicron variant is probably related to the crystal structure changes caused by more than 30 mutations in the virus Spike protein [5].

### 2. Omicron strains and childhood hepatitis

The experience in Shanghai showed gastrointestinal symptoms caused by Omicron variants to be relatively rare. Kei et al. demonstrated that the Omicron variant strain had a lower proliferation efficiency in the intestinal model. They assayed the viral RNA and titer in the culture supernatant and found that the Omicron variants had an extremely low replication capacity [6]. A large retrospective study on the Omicron outbreak in South Africa showed that the hospitalization rate in adolescents and children to be significantly higher than those reported in the previous outbreaks. Children under the age of 20 years accounted for 14.3% of the total number of hospitalized patients, and about 25.4% of infected children under the age of 5 years needed hospitalization [7]. In the United States, the hospitalization rate of children infected with Omicron was also reported to be high, and 19% infected children required ICU treatment [8]. The possible reasons are weak immunity, low vaccination rates, and high respiratory infection rates in adolescents and children. Recently, the United Kingdom, the United States, Japan and other countries reported unexplained acute hepatitis in children with a history of Omicron variant infection. The pathological cause may be due to continuous release of viral proteins from the Omicron variant that resides in the intestinal epithelium, resulting in production of “superantigens” which mediate multisystem inflammatory syndrome in children who present with fever, rash, vomiting and diarrhea. If an adenovirus is infected during this process, the influence of the “superantigen” becomes more obvious, resulting in abnormal immunity reaction and an outbreak of acute hepatitis [9]. Hiroshi et al. collected information on Omicron infection in 39 countries and found that countries with fulminant hepatitis in children also had a higher number of Omicron infections ( $p = 0.013$ ). They postulated that previous exposure to Omicron variants increases the risk of developing severe hepatitis in children [10]. Although the Omicron variant is less replicable in intestinal epithelium, particular attention should be paid to infection of the Omicron variant in children because it can cause more serious complications.

### 3. Fecal excretion and sewage detection of Omicron strains

Notably, the SARS-CoV-2 virus can be isolated from the feces of more than half of infected individuals, suggesting that the SARS-CoV-2 virus can infect and replicate in the gut. Anal swab nucleic acid test results have gradually attracted our attention. For patients who were admitted

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to our hospital during the Shanghai epidemic, the positive rate of anal swabs from people infected with the Omicron strain was higher than those from people infected with the original COVID-19 strains. The results of anal swabs are now also used as one of the criteria to decide whether a patient should be discharged home. When the SARS-CoV-2 pandemic broke out globally at the beginning of 2020, the Wuhan Institute of Virology in China detected virus content in wastewater near designated quarantine hospitals, and also found the number of infected people was increased in regions where the virus content in wastewater was high, suggesting wastewater testing can serve as an early warning signal of gathering of infected persons. Since the outbreak of COVID-19, the Swedish Centre for Environmental Epidemiology has been conducting virus testing in Swedish urban wastewater to monitor the spread of the SARS-CoV-2 virus. Their results in February 2022 showed that the virus content of the Omicron variant surpassed that of the Delta variant [11]. The Department of Laws and Regulations of the National Health Commission of the People's Republic of China issued a notice on the "Standards for Novel Coronavirus Enrichment and Concentration in Sewage and Nucleic Acid Detection Methods" in April 2022, which standardizes nucleic acid sampling and detection methods in sewage [12]. The use of regional wastewater virus detection hopefully can quickly curb the spread of the virus in an early stage with the advantages of low cost, rapidity and high accuracy.

#### 4. Summary

The Omicron variant has the characteristics of fast transmission, mild symptoms, and ease to cause regional cluster outbreaks. Special attention should be paid to the protection of immunocompromised people, the elderly and young children. To facilitate early detection and prevention of regional virus transmission, continual regional wastewater testing is recommended.

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#### Data statement

This correspondence did not yield data and thus no data were available.

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