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Duration for Carrying SARS-CoV-2 in COVID-19 Patients

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Dear Editor,

We read with interest the report that written by Yu and colleagues.¹ This report retrospectively analyzed laboratory-confirmed novel coronavirus disease 2019 (COVID-19) pneumonia patients and summarized the clinical characteristics of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) reactivation. However, deep understanding of SARS-CoV-2 carrying duration, the time of infection, as well as its antiviral treatment period can contribute to the management and treatment for COVID-19.

The COVID-19 caused by SARS-CoV-2 has transmitted quickly as a global public health emergency, with the characteristics of a high contagiousity, quick transmission and general susceptibility.² Previous studies mainly focused on the epidemiological, clinical characteristics, as well as prevention and control measures of COVID-19.³ However, few studies demonstrated the duration for SARS-CoV-2 carrying in COVID-19 patients. Here, we collected the positive SARS-CoV-2 nucleic acid cases and examined the duration for SARS-CoV-2 carrying and its characteristics in different populations.

From January 20, 2020 to March 1, 2020, inpatients with a specific SARS-CoV-2 epidemiological history and a positive SARS-CoV-2 nucleic acid test were collected in this retrospective study in Henan province. We compared the durations for carrying virus SARS-CoV-2 in different ages, gender, disease condition. The duration for SARS-CoV-2 carrying was defined as the time from a close contact with the source of infection to the last positive test for COVID-19 virus. Cases in this study were also divided into severe group and non-severe group to study. The definitions of severe group (including critically ill) and group of the non-severe type were in Table 1.

A total of 161 cases with a clear source of infection and time of exposure were collected in this study. 89 (55.3%) were male, and 72 (44.7%) were female. The median age was 44 years (2 to 94 years). The median duration for SARS-CoV-2 carrying was 26 days (6-50 days), with a P25 of 19 days, and P75 of

28 days. The median duration for carrying SARS-CoV-2 was 21 days (IQR 16.5 to 29 days) in 89 male patients, and was 20 days (IQR 16 to 26.8 days) in 72 female patients. There was no significant difference between the two groups ($P > 0.05$) (Table 2).

Age 60 was defined as the threshold, and these cases were divided into 0-59 years old group and ≥ 60 years old group. There were 126 cases in the 0-59 age group with a median duration for carrying SARS-CoV-2 of 20 days (IQR 16 - 28 days), and 35 cases in the ≥ 60 -year-old group with a median time of 28 days (IQR 19-33 days). The difference between the two groups was statistically significant ($P < 0.01$) (Table 2). The median duration for carrying SARS-CoV-2 was 20 days (IQR 16- 26 days) in the group of the non-severe type (N = 124), and 27 days (IQR 19 -33 days) in the severe group (N = 37). There was significant difference in two groups ($P < 0.01$). The nucleic acid test for 9 deaths remained positive or turned negative after a long period (Table 2).

As a newly discovered infectious disease in December 2019, COVID-19 has been pandemic in the world for 3 months, which correlates with the extremely strong transmission of SARS-CoV-2.⁴ The reasons for SARS-CoV-2's strong infectious capacity were recognized mainly related to its respiratory tract transmission, as well as the infectivity of all cases including patients in the incubation period, patients with typical or atypical clinical symptoms, and asymptomatic carriers.^{3,5,6} Therefore, we defined the duration for carrying SARS-CoV-2 as the time from a close contact with the source of infection to the last positive test for nucleic acid.

Severe acute respiratory syndrome (SARS), which ravaged the world in the spring of 2003, was also an acute respiratory infection, caused by the SARS coronavirus (SARS-CoV). At the beginning of SARS, the virus positive rate was low. Within 6-11 days of onset, this rate was calculated 58%, and the virus titer peaked 12-14 days after onset of the illness.⁷ However, COVID-19 is contagious at all stages of the disease. Results of this study indicate that the median duration of SARS-CoV-2 carrying in patients was 26 days (IQR 19 - 28 days), and the longest can reach 50 days. Therefore, COVID-19 disease may have the characteristics of longer infectivity and stronger infectivity than SARS. Although some corresponding countermeasures have been made at the beginning of the COVID-19 epidemic worldwide, the world pandemic of COVID-19 have not been stopped in the short term.

Although studies have shown that elderly male patients may be a factor of poor prognosis of COVID-19 disease,⁸ results of this study indicate that the duration for carrying SARS-CoV-2 has nothing to do with gender. Previous studies demonstrated that the elderly was the predominant among the deaths, and the older represented as an independent predictor of COVID-19 mortality.⁹ The results indicate that the duration for carrying SARS-CoV-2 is related to the age of patients. The median duration in the ≥ 60 years old group was 28 days (IQR 19 to 33 days), versus 20 days (IQR 16 - 28 days) in the 0-59 years old group. The persistent SARS-CoV-2 in elderly patients may be the initiating factor that causes organ damage, especially persistent inflammation of the alveoli, and disease progression. Therefore, persistent existence of virus SARS-CoV-2 in the body could be a reason for the high mortality rate in elderly patients.

Previous studies have found that viral RNA clearance in H7N9 survivors was significantly faster than death cases, and prolonged viral shedding was reported associated with death outcomes.¹⁰ This study also showed that the virus was carried longer in the severe cases than in the non-severe type, and that the result of nucleic acid test remained positive or turn negative after a long period in 9 died cases. Therefore, the persistent existence of SARS-CoV-2 could contribute to a worse disease and poor prognosis.

In conclusion, patients infected tend to have a long SARS-CoV-2 carrying and infectious duration, which requires an early persistent isolation and monitoring strategy, and longer antiviral therapy for infected cases. Long-term SARS-CoV-2 carrying may serve as the consideration for the continued exacerbation of the condition in elderly and severe patients over 60 years of age.

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Table 1. The definition of severe group and group of the non-severe type

Severe Group (including critical cases)	meeting any of the following three point ·markedly faster breathing, greater than 30 beats / min ·blood oxygen saturation < 90% in resting state ·a significant decrease in blood oxygen saturation by arterial blood gas analysis Patients with progressed lesions for more than 50% within 24 hours to 48 hours by chest CT scanning, were treated according to the principle of severe cases.
Group of the non-severe type	patients who were lighter than the severe

Table 2. Duration for carrying SARS-CoV-2 in 161 COVID-19 cases

	Total (N=161)	Duration for carrying SARS-CoV-2 (day)	P
Total	161	26(IQR19-28)	/
Age			< 0.01
0-59	126	20(IQR16-28)	
≥60	35	28(IQR19-33)	
Gender			> 0.05

Male	89	21(IQR16.5-29)	
Female	72	20(IQR16-26.8)	
Condition			< 0.01
Non-severe type	124	20(IQR16-26)	
Severe type	37	27 (IQR19-33)	

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