Presumptive COVID-19 reinfection cases

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Abstract

As the number of confirmed cases of coronavirus disease 2019 (COVID-19) surged after the emergence of the Omicron variant in December 2021, the possibility of reinfection surfaced. Therefore, 16,130,920 cumulative confirmed cases from January 2020 to April, 2022, were investigated for presumptive COVID-19 reinfection. The results revealed that there were 55,906 presumptive reinfection cases, with a reinfection incidence rate of 0.35%. The number of COVID-19 reinfection cases increased by approximately three times from January to April 2022, which is the period after the Omicron variant outbreak, compared with that noted before the Omicron variant outbreak. The occurrence of presumptive COVID-19 reinfection cases shows an increasing trend because the number of confirmed cases surged after to the Omicron variant outbreak and individuals with a positive rapid antigen test result were also recognized as confirmed cases.

Key words: COVID-19, Redetection, Reinfection, Omicron variant

Introduction

Due to the prolonged COVID-19 pandemic, several variants of severe acute respiratory syndrome coronavirus 2, which causes coronavirus disease 2019 (COVID-19), have emerged. With the emergence of the Omicron variant, the number of confirmed cases has been rapidly increasing. In this regard, presumptive reinfection cases continue to be reported. The incidence rate of presumptive COVID-19 reinfection was 10% of all confirmed cases from January to February 2022 in the UK [1] and 3.1% of all confirmed cases from March 2021 to February, 2022, in France [2]. The Korea Disease Control and Prevention Agency (KDCA) has been monitoring presumptive registered reinfection cases as redetection cases with the COVID-19 information management system. However, the possibility of COVID-19 reinfection is high due to the recent Omicron variant outbreak, and all confirmed COVID-19 cases are being reinvestigated to identify COVID-19 reinfection cases. The aim of this study was to investigate the incidence of presumptive COVID-19 reinfection cases and analyze data based on presumptive reinfection cases.

Methods

The participants of this study were 16,130,920 cumulative patients with confirmed COVID-19 from January 2020 to April 16, 2022. An investigation regarding presumptive reinfection cases was conducted based on the information on the current status of confirmed cases registered up to April 16, 2022, with the COVID-19 information management system of the KDCA. According to the 12th edition of the Guidelines for Coronavirus Disease 2019 Response (for local governments), individuals with presumptive reinfection are defined as: 1) those with a redetected positive test result 90 days after the first infection with or without symptoms, and 2) those with a redetected positive test result 45-89 days after the first infection with symptoms, exposure to a confirmed patient, or a history of overseas travel [3]. Additionally, a confirmed reinfection case is defined as a case wherein the polymerase chain reaction (PCR) samples from the first and the second infections from patients with presumptive reinfection are obtained, and a strain different from the first infection is confirmed by whole genome sequencing of the sample from the second infection sample. However, considering that the number of confirmed cases is rapidly increasing, and there are practical difficulties in securing samples, this report analyzed data based on presumptive reinfection cases. From March 14, 2022, individuals with a positive rapid antigen test (RAT) result were recognized as confirmed COVID-19 cases.

From the information on the current status of confirmed cases registered with the COVID-19 information management system, it was not possible to identify whether PCR or RAT was used as the testing method at the time of redetection. Therefore, in this investigation, we defined presumptive reinfection cases as those with a positive PCR or RAT result 45 days after the first infection with or without symptoms.

Results

1) Current status of presumptive COVID-19 reinfection cases

As of April 17, 2022, a total of 55,906 presumptive COVID-19 reinfection cases were identified among the 16,130,920 cumulative confirmed COVID-19 cases, with a reinfection incidence rate of 0.35%. The COVID-19 reinfection cases comprised 55,841 second infection cases (99.9%) and 65 third infection cases (0.1%).



Figure 1. Number of confirmed cases by week and incidence rate of presumptive reinfection cases

Analysis of 55,841 second infection cases revealed that in terms of time period, the incidence rate was 0.10% (553/559,385) before the Omicron variant outbreak or until December 2021 and 0.36% (55,288/15,571,470) after the Omicron variant outbreak or after January 2022, indicating that the number of presumptive COVID-19 reinfection cases increased by approximately 3.6 times during the dominance of the Omicron variant or after January 2022.

In terms of the reinfection incidence rate by week, the incidence rate of COVID-19 reinfection was 0.45-0.46% in the 3rd and 4th weeks of 2022, then showing a decreasing trend, but was continuously increasing from the 9th week with the highest incidence of 0.50% noted in the 15th week (Figure 1). The number of presumptive reinfection cases is increasing since the number of confirmed cases surged due to the Omicron variant outbreak, and those with a positive RAT result were recognized as confirmed cases, effective from the 11th week of 2022.

2) Characteristic of presumptive COVID-19 reinfection cases and incidence rate

Among presumptive COVID-19 reinfection 55,841 cases from January 2020 to April 16, 2022, the number of presumptive COVID-19 reinfection cases within 45-89 days was 2,540 (4.5%), and over 90 days was 53,301 (95.5%) (Table 1).

The incidence rate in sex was similar between male (0.35%) and female (0.34%). In age groups, incidence rate was higher in aged < 18 years (0.47%), and aged 18-29 years (0.40%) than other groups. Metropolitan area showed the highest incidence rate (0.44%).

In terms of incidence rate by week, the incidence rate of COVID-19 reinfection was 0.13% in dominance of Delta variant. The incidence rate of COVID-19 reinfection in dominance of Omicron variant BA.1 was 0.30% and Dominance of Omicron variant BA.2 was 0.43%. The incidence rate of presumptive COVID-19 reinfection cases has increased for 3 times, compared dominace of Delta variant to Omicro variant period.

Incidence rate in patients and workers in long-term care hospitals was 0.59%, it was 1.73 times higher than others (0.34%). According to history of vaccination at reinfection, incidence rate in unvaccinated group was 0.54%, 2nd vaccination completed group was 0.41%, and 3rd vaccination completed group was 0.21%. There were similar or lower incidence rate in 1st or 2nd vaccination group, compared to unvaccinated group. It may due to the small size of fourth vaccination completed group.

3) Status of severe cases

The number of severe COVID-19 cases (including critical cases and deaths) after COVID-19 reinfection was 72, and the incidence rate of severe cases was 0.13%. The number of deaths after COVID-19 reinfection was 52, and the fatality rate in those with COVID-19 reinfection was 0.09% (Table 2). Additionally, 64 (88.9%) of the severe cases and 50 (96.2%) of the death cases were of patients in their 60s or older.

Conclusion

As of April 17, 2022, the number of presumptive COVID-19 reinfection cases in the Republic of Korea was 55,841, and the reinfection incidence rate was 0.35%. The number of presumptive COVID-19 reinfection cases 90 days after the first infection was 53,301, accounting for 95.5% of all reinfection cases. In terms of time period, 99.0% of the presumptive COVID-19 reinfection occurred during the dominance of the Omicron variant. The incidence rate of presumptive COVID-19 reinfection was found to be relatively lower in the Republic of Korea than in other

Table 1. Status of COVID-19 reinfection cases and reinfection incidence

Classification		Presumptive reinfection cases ^a				No. of confirmed	
	Total⁰ -	Total		45-89 days	≥90 days	casess	
	n	n	%	n	n	n	%
Total	16,130,855	55,841	0.35	2,540	53,301	16,075,014	100.0
Reinfection period (confirmed)							
Before 3/13/2022	6,726,887	17,659	0.26	1,028	16,631	6,709,228	41.7
3/14/2022~3/19/2022	9,403,968	38,182	0.41	1,512	36,670	9,365,786	58.3
Reinfection period (variant)							
Before Delta variant (~6/2021)	133,502	8	0.01	-	8	133,494	0.8
Dominance of Delta variant (7/2021~12/2021)	425,883	545	0.13	94	451	425,338	2.6
Dominance of Omicron variant BA.1 (1/2022~3/29/2022)	8,664,294	25,629	0.30	1,092	24,537	8,638,665	53.7
Dominance of Omicron variant BA.2 (after 3/20/2022)	6,907,176	29,659	0.43	1,354	28,305	6,877,517	42.8
Sex ^c							
Male	7,588,561	26,660	0.35	1,201	25,459	7,561,901	47.0
Female	8,542,277	29,181	0.34	1,339	27,842	8,513,096	53.0
Age group° (years)							
0-17	3,808,039	17,926	0.47	1,397	16,529	3,790,113	23.6
18–29	2,683,865	10,641	0.40	294	10,347	2,673,224	16.6
30-39	2,387,983	8,209	0.34	242	7,967	2,379,774	14.8
40-49	2,481,334	7,149	0.29	190	6,959	2,474,185	15.4
50-59	1,969,973	4,742	0.24	117	4,625	1,965,231	12.2
60-74	2,052,693	5,072	0.25	185	4,887	2,047,621	12.7
≥75	746,949	2,102	0.28	115	1,987	744,847	4.6
Region (domestic)°							
Metropolitan area	8,695,195	38,197	0.44	788	37,409	8,656,998	53.9
Chungcheong area	1,669,532	4,461	0.27	368	4,093	1,665,071	10.4
Honam area	1,492,288	2,644	0.18	498	2,146	1,489,644	9.3
Gyeongbuk area	1,307,387	3,542	0.27	274	3,268	1,303,845	8.1
Gyeongnam area	2,311,045	4,730	0.21	377	4,353	2,306,315	14.4
Gangwon area	442,070	1,187	0.27	122	1,065	440,883	2.7
Jeju area	208,013	678	0.33	107	571	207,335	1.3
Status							
Immunosuppressed	409,697	1,006	0.25	33	973	408,691	2.5
Long-term care hospitals/facilities	307,183	1,814	0.59	77	1,737	305,369	1.9
Others	15,413,975	53,021	0.34	2,430	50,591	15,360,954	95.6
History of vaccination at reinfection							
Unvaccinated	3,638,932	19,513	0.54	1,538	17,975	3,619,419	22.5
1st vaccination completed	187,490	1,204	0.64	63	1,141	186,286	1.2
2 nd vaccination completed	4,565,171	18,549	0.41	493	18,056	4,546,622	28.3
3 rd vaccination completed	7,705,070	16,394	0.21	443	15,951	7,688,676	47.8
4 th vaccination completed	34,150	181	0.53	3	178	33,969	0.2

° 55,841 cases of presumptive reinfection (2nd infection) 45 days after the initial infection

^b Excluded third infection cases (65)

° 17 cases without information on sex, 19 cases without information on age, and 5,325 imported cases were excluded

Classification	Total	S	ex	Age groups (years)			
		Male	Female	40-49	50-59	60-74	≥75
Severe cases (critical cases + deaths)	72	42	30	2	6	28	36
	(100)	(58.3)	(41.7)	(2.8)	(8.3)	(38.9)	(50.0)
Death	52	28	24	-	2	20	30
	(100)	(53.8)	(46.2)	-	(3.8)	(38.5)	(57.7)

Table 2. Status of severe COVID-19 cases and death

countries. However, the number of presumptive reinfection cases is expected to increase with the increasing number of confirmed cases after the Omicron variant outbreak.

Considering the difficulty in analyzing individual cases for SARS-CoV-2 variants due to the rapidly increasing number of confirmed cases, it is necessary to revise the criteria for classifying cases and the COVID-19 testing-related criteria to ensure continuous monitoring of the risk of COVID-19 reinfection. Moreover, to prevent COVID-19 reinfection, individuals must follow self-quarantine guidelines for COVID-19 and maintain social distancing. Even those who have been infected with COVID-19 should not neglect the importance of vaccination.

1. What was previously known?

It was believed that patients with confirmed COVID-19 cannot be reinfected.

2. What is newly learned?

As of April 17, 2022, there were 55,906 COVID-19 reinfection cases among 16,130,920 cumulative confirmed COVID-19 cases, and the incidence rate of COVID-19 reinfection was 0.35%. The COVID-19 reinfection cases comprised 55,841 second infection cases (99.9%) and 65 third infection cases (0.1%).

The incidence rate of presumptive COVID-19 reinfection in the Republic of Korea was relatively lower than that in foreign countries.

3. What are the implications?

To monitor the occurrence of COVID-19 reinfection in the Republic of Korea, it is necessary to use PCR and RAT in parallel.

It is necessary to evaluate the transmission potential from those with presumptive COVID-19 reinfection to their cohabitants at the time of reinfection and to present accurate criteria for classifying COVID-19 reinfection cases by supplementing the definitions of COVID-19 redetection and reinfection in the Republic of Korea.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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May 2, 2022

References

- Office for National Statistics [Internet]. Newport (UK): Coronavirus (COVID-19) Infection Survey, characteristics of people testing positive for COVID-19, UK: 16 March 2022; [cited 2022 Mar 30]. Available from: https://www.ons.gov. uk/peoplepopulationandcommunity/healthandsocialcare/ conditionsanddiseases/bulletins/coronaviruscovid19infectionsurve ycharacteristicsofpeopletestingpositiveforcovid19uk/30march2022
- Bastard J, Taisne B, Figoni J, et al. Impact of the Omicron variant on SARS-CoV-2 reinfections in France, March 2021 to February 2022. Euro Surveill. 2022;27(13)
- 3. Korea Disease Control and Prevention Agency, editor. [COVID-19 response guideline, edition 12]. Cheongju (Korea): 2022. Korean.

This article has been translated from the Public Health Weekly Report (PHWR) Volume 15, Number 18, 2022.