# Incidence and fatality rates of SARS-CoV-2 Omicron variant compared with Delta variant in long term care facilities

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## Abstract

The Omicron variant in South Africa described it as being associated with rapid spread, mild symptoms, low severity, and low mortality. In the Republic of Korea (ROK), as of April 4, 2022, the cumulative number of confirmed cases of Coronavirus disease 2019 (COVID-19) was 14,003,031. This study analyzed the incidence and fatality rate according to the type of variant and vaccination status of 2,588 patients and workers in nine long term care facilities in the ROK where Delta and Omicron variants were identified between October 23, 2021, and February 18, 2022. The incidence rate of the Omicron variant was about 11.18 times (95% CI: 8.90-14.04) higher than that of the Delta variant, and the fatality rate of the Omicron variant was about 48% (aRR=0.52; 95% CI: 0.32-0.87) lower. In the Delta variant group, the vaccine was effective in 44% (aRR=0.56; 95% CI: 0.42-0.76) of those who had received second vaccinations and 83% (aRR=0.17; 95% CI: 0.12-0.26) of those who had received third vaccinations. The preventive effect of the fatality rate in the Delta variant was 85% (aRR=0.15; 95% CI: 0.06-0.33) for those who completed the second vaccination and 94% for those who completed the third vaccination (aRR=0.06; 95% CI: 0.01-0.43). In the Omicron variant group, the preventive effects of the vaccine were 84% (aRR=0.16; 95% CI: 0.06-0.38) for those who had received third vaccinations, compared to unvaccinated group. While the fatality rate of the Omicron variant is lower than that of the Delta variant, the number of confirmed cases is higher. However, due to the rapidly increasing number of confirmed cases despite the low fatality rate of Omicron in the ROK, severe cases and deaths has increased. This analysis can be further developed and supplemented to identify the virus characteristics of new variants in the future. Moreover, we expect these results to be utilized as evidence for policy decisions related to new variants of COVID-19.

Key words: Coronavirus disease 2019, Long term care facility, Delta variant, Omicron variant, Incidence rate, Fatality rate

# Introduction

In November 2021, South Africa reported the presence of a new Coronavirus disease 2019 (COVID-19) variant to World Health Organization (WHO). The characteristics of this variant were the possibility of immune escape and rapid spread, and WHO classified it as a variant of concern and named it Omicron [1,2].

Early reports of the Omicron variant in South Africa described it as being associated with rapid spread, mild symptoms, low severity, and low mortality [3]. In the Republic of Korea (ROK), as of April 4, 2022, the cumulative number of confirmed cases of COVID-19 was 14,003,031. The fatality rate during the Delta variant epidemic was 0.83%. As of April 4, 2022, the fatality rate was 0.12%, but due to the explosive increase in the number of confirmed cases of COVID-19, the number of deaths per 100,000 population increased rapidly to 1.05 in the fourth week of February, 1.74 in the first week of March, 2.61 in the second week of March, and 3.79 in the third week of March, 2022 [4,5].

Long term care facilities (LTCFs) where most patients have underlying diseases, are not safe during COVID-19 outbreaks. When an infectious agent is introduced, LTCFs have the highest incidence and severity. LTCFs have been trying to reduce the number of COVID-19 cases through preemptive testing, visitor control, and vaccination. Nevertheless, the number of confirmed cases and deaths has been increasing due to the Omicron variant, which is easily spread and not as easily prevented by vaccination [6]. Accordingly, to understand the characteristics of the Omicron variant domestically and abroad, various studies such as an analysis of the vaccine effect on the Omicron variant [7], analysis of the vaccine effect on the Delta versus Omicron variants [8], and analysis of hospitalization rates between the Delta and Omicron variants have been conducted. This study aimed to examine and compare the incidence and fatality rates of Delta and Omicron variants in nine LTCFs where Delta and Omicron variants were confirmed. The vaccine effectiveness of the nursing hospital subjects was estimated and evaluated.

# Results

#### 1. Subjects

In total, 2,588 Patients and workers of nine LTCFs where Delta and Omicron variants of COVID-19 were confirmed between October 23, 2021, and February 18, 2022, were included in the this study. Of these, 1,571 subjects from six LTCFs and 1,017 subjects from three LTCFs where Delta and Omicron variants occurred were analyzed, respectively. The observation period for the number of confirmed cases and deaths in each group was 28 days after the last confirmed case. The data were collected from each Reginal Center for Disease Control and Prevention, Korea Centers for Disease Control and Prevention and local governments. The variants of each group were confirmed at a laboratory. The incidence rate of the Delta variant among LTCFs ranged from 10.9% to 41.8%, and the number of deaths ranged from 2 to 29. The incidence rate of the Omicron variant ranged from 37.9% to 78.0%, and the number of deaths ranged from 3 to 22. The detailed status of each LTCFs is presented in Tables 1 and 2.

Category	Incheon A LTCF	Gyeonggi B LTCF	Gwangju C LTCF	Gyeongju D LTCF	Daegu E LTCF	Daegu F LTCF
Variant	Delta	Delta	Delta	Delta	Delta	Delta
Facilities	-	-	Five floors of wards with 227 beds	187 beds	180 beds	289 beds
Population (n)	Patients: 185 Workers: 146	Patients: 113 Workers: 80	Patients: 47 Workers: 20	Patients: 151 Workers: 97	Patients: 161 Workers: 103	Patients: 269 Workers: 199
Vaccination status (rate of third vaccination at the start of the spread)	57.1%	80.3%	67.2%	52.4%	0.0%	0.0%
Index patient	Patient asymptomatic date of diagnosis: Dec. 21	Worker date of symptoms: Dec. 24 Date of diagnosis: Dec. 28	Worker asymptomatic date of diagnosis: Dec. 21	Patient date of symptoms: Jan. 5 Date of diagnosis: Jan. 7	Worker date of symptoms: Nov. 19 Date of diagnosis: Nov. 23	Worker date of symptoms: Oct. 21 Date of diagnosis: Oct. 23
Period of outbreak	Dec. 21-Jan. 3.	Dec. 28-Jan 3.	Dec. 22-Jan. 12	Jan. 6-30	Nov. 23-Dec. 20	Oct. 23-Nov. 24
Incidence rate	Total 10.9% Patients: 13.5% Workers: 7.5%	Total 10.9% Patients: 10.6% Workers: 11.3%	Total 41.8% Patients: 55.3% Workers: 10.0%	Total 21.4% Patients: 33.1% Workers: 3.1%	Total 31.1% Patients: 39.8% Workers: 17.5%	Total 29.5% Patients: 39.8% Workers: 15.6%
Death (n)	8	2	5	8	9	29

#### Table 1. Details of long term care facilities (LTCFs) with Delta variant

## Table 2. Details of long term care facilities (LTCFs) with Omicron variant

Category	Gwangju G LTCF	Gwangju H LTCF	Busan I LTCF
Variant	Omicron	Omicron	Omicron
Facilities	Five floors of wards	Four floors of wards	-
Population (n)	Patients: 397 Workers: 233	Patients: 64 Workers: 23	Patients: 183 Workers: 117
Vaccination status (rate of third vaccination at the start of the spread)	72.4%	35.6% (one floor)	71.3%
Index patient	Caregiver date of symptoms: Dec. 20 Date of diagnosis: Dec. 24	Worker asymptomatic date of diagnosis: Dec. 24	Patient asymptomatic date of diagnosis: Feb. 5
Period of outbreak	Dec. 24-Feb. 5	Dec. 24-Jan. 15	Feb. 5-18
Incidence rate	Total 66.0% Patients: 84.4% Workers: 34.8%	Total 37.9% Patients: 39.1% Workers: 34.8%	Total 78.0% Patients: 96.7% Workers: 48.7%
Death (n)	22	3	6

## 2. Results

Of the 2,588 subjects, 358 (34.39%) and 683 (65.61%) were confirmed to have the Delta and Omicron variants, respectively. Among the confirmed patients, 62 (63.26%) with the Delta variant and 36 (36.74%) with the Omicron variant died. Among the subjects with the Delta variant, 70.59% were female, 42.84% were aged 75 years or older, 58.94% were patients at a LTCF, and 42.39% had received second vaccinations. Among those who had received second vaccinations, 82.13% had received viral-vector vaccines, and 79.13% had received their second vaccination

more than 90 days prior. Among those who had received third vaccinations, 93.64% received an mRNA vaccine after a viral-vector vaccine. Furthermore, among the subjects with the Omicron variant, 73.65% were female, 48.08% were aged 75 or older, 63.32% were patients at a LTCF, and 68.83% had received third vaccinations. Among those who had received second vaccinations, 61.67% had received viral-vector vaccines, and 71.11% had received their second vaccinations more than 90 days prior. Among those who had received third vaccinations, 92.29% received an mRNA vaccine after a viral-vector vaccines (Table 3). Comparing the incidence rate of the Omicron variant versus

	Table 3. General	characteristics of	of the sub	iects in lon	g term care	facility	(LTCFs)	) by \	variar
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	Catagoni			Delta va	riant (n, %)	)		Omicron variant (n, %)					
Calegory		Т	otal	Con	firmed	D	eath	T	otal	Con	firmed	D	eath
Total		1,571	100	358	100	62	100	1,017	100	683	67.16	36	5.27
Sex													
	Male	462	29.41	117	32.68	23	37.10	268	26.35	186	27.23	6	16.67
	Female	1,109	70.59	241	67.32	39	62.90	749	73.65	497	72.77	30	83.33
Age gr	oup												
	$\leq$ 59 y	485	30.87	48	13.41	5	8.06	293	28.81	119	17.42	1	2.78
	60-74 y	413	26.29	86	24.02	5	8.06	235	23.11	162	23.72	4	11.11
	≥ 75 y	673	42.84	224	62.57	52	83.87	489	48.08	402	58.86	31	86.11
Class													
	Patients	926	58.94	284	79.33	61	98.39	644	63.32	537	78.62	36	100
	Workers	645	41.06	74	20.67	1	1.61	373	36.68	146	21.38	0	0.00
Vaccin	ation status												
U	nvaccinated	344	21.90	146	40.78	48	77.42	103	10.13	81	11.86	14	38.89
	First	42	2.67	14	3.91	5	8.06	34	3.34	29	4.25	2	5.56
	Subtotal	666	42.39	154	43.02	8	12.90	180	17.70	114	16.69	10	27.78
Seco	nd $\leq$ 90 d	143	21.47	40	25.97	4	50	52	28.89	29	25.44	1	10.00
	≥ 90 d	527	79.13	119	77.27	4	50	128	71.11	86	75.44	9	90.00
Thir	$d \leq 90 d$	519	33.04	44	12.29	1	1.61	700	68.83	459	67.20	10	27.78
Vaccine	es typeª												
Second	l vaccination												
\	/iral-vector	547	82.13	131	85.06	6	75.00	111	61.67	72	63.16	6	60.00
	mRNA	109	16.37	25	16.23	2	25.00	56	31.11	33	28.95	4	40.00
	Mixed	14	2.10	3	1.95	0	0	13	7.22	10	8.77	0	0.00
Third va	accination												
$\vee$	/iral-mRNA	486	93.64	34	77.27	1	100	646	92.29	422	91.94	10	100
m	RNA-mRNA	27	5.20	5	11.36	0	0	47	6.71	32	6.97	0	0.00
Μ	lixed-mRNA	2	0.39	0	0	0	0	7	1.00	4	0.87	0	0.00

<sup>a</sup> Viral-vector: AstraZenca, Janssen / mRNA: Moderna, Pfizer

Delta, the relative risk was estimated using logistic regression and adjusted for sex, age, status, and vaccination status in the model. The incidence rate of the Omicron variant was about 11.18 times (95% CI: 8.90-14.04) higher than that of the Delta variant in all subjects. According to the general characteristics, incidence rate of the Omicron variant versus Delta after stratification was 11.85 times (95% CI: 9.00-15.60) for females, 15.33 times (95% CI: 9.34-25.16) for aged 60-74 years (95% CI: 9.34-25.16), 15.17 times for patients in LTCF (95% CI: 11.37-20.24), 4.60 times (95% CI: 2.69-7.86) in the unvaccinated group, and 29.26 times (95% CI: 19.90-43.03) in the group that had received thrid vaccinations (Table 4).

To compare the incidence rate between vaccinated and unvaccinated people, the comparative risk was stimated using a logistic regression analysis. Sex, age, class, and vaccination status were adjusted in the model. Among all subjects, compared to unvaccinated subjects, the preventive effects of vaccination was 38% (aRR=0.62; 95% CI: 0.47-0.81) for those who had received second vaccinations and 59% (aRR=0.41; 95% CI: 0.31-0.55) for those who had received third vaccinations. In addition, the comparative risk was estimated by adjusted according to the type of variant and age. In the Delta variant group, the vaccine was effective in 44% (aRR=0.56; 95% CI: 0.42-0.76) of those who had received third vaccinations. The results of the Omicron variant group were not statistically significant. Among those aged 60 to 74 years, the vaccine was effective in 71% of those who had received third vaccinations (aRR=0.29;

Table 4. Relativ	e risk of the	e incidence	rates of	the Delta	variant	versus the	Omicron	variant
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	Delta				Omicron		Delta vs	Delta vs. Omicron		
	Population (n)	confirmed	%	Population (n)	confirmed	%	Relative Risk (95% CI)	Adjusted Relative Risk <sup>a</sup> (95% CI)		
Total	1,571	358	22.79	1,017	683	67.16	6.92 (5.81–8.26)	11.18 (8.90–14.04)		
Sex										
Male	462	117	25.32	268	186	69.40	6.69 (4.79–9.34)	9.88 (6.52–14.97)		
Female	1,109	241	21.73	749	497	66.36	7.10 (5.77–8.75)	11.85 (9.00-15.60)		
Age group										
≤ 59 y	485	48	9.90	293	119	40.61	6.22 (4.27–9.10)	8.67 (5.52–13.61)		
60-74 y	413	86	20.82	235	162	68.94	8.44 (5.86–12.15)	15.33 (9.34–25.16)		
≥ 75 y	673	224	33.28	489	402	82.21	9.26 (6.99–12.28)	11.30 (8.22–15.54)		
Class										
Patients	926	284	30.67	644	537	83.39	11.35 (8.83–14.57)	15.17 (11.37–20.24)		
Workers	645	74	11.47	373	146	39.14	4.96 (3.61-6.83)	6.61 (4.49–9.74)		
Vaccination status										
Unvaccinated	344	146	42.44	103	81	78.64	4.99 (2.97–8.38)	4.60 (2.69–7.86)		
First vaccination	42	14	33.33	34	29	85.29	11.60 (3.69–36.47)	10.09 (2.72–37.44)		
Second vaccinations	666	154	23.12	180	114	63.33	5.83 (4.09–8.31)	5.33 (3.68–7.73)		
Third vaccinations	519	44	8.48	700	459	65.57	20.48 (14.49-28.94)	29.26 (19.90-43.03)		

<sup>a</sup> Adjusted for sex, age, class, and vaccination status

95% CI: 0.15-0.55). Among those over 75 years old, the vaccine was effective in 51% (aRR=0.49; 95% CI: 0.34-0.69) of those who had received second doses and 58% (aRR=0.42; 95% CI: 0.29-0.61) of those who had received third doses (Table 5).

Comparing the fatality rate of the Omicron variant versus Delta the comparative risk was estimated using logistic regression, and sex, age, status, and vaccination status were adjusted in the model. In all subjects, the fatality rate of the Omicron variant was about 48% (aRR=0.52; 95% CI: 0.32-0.87) lower than that of the Delta variant. In the comparative analysis of the fatality rate of the Delta variant versus Omicron after stratification by general characteristics, the fatality rate was 67% for males (aRR=0.33; 95% CI: 0.12-0.91), 51% for those 75 years or older (aRR=0.49; 95% CI: 0.28-0.84) and 48% for Patients of nursing homes (aRR=0.52; 95% CI: 0.32-0.86). In addition, in the unvaccinated group, the fatality rate of the Omicron variant compared to the Delta variant was 58% lower (aRR=0.42; 95% CI: 0.21-0.83) (Table 6).

The relative risk was estimated using logistic regression to compare the fatality rate between vaccinated and unvaccinated people, and sex, age, status, and vaccination status were adjusted in the model. The preventive effects of the vaccine were 74% (aRR=0.26; 95% CI: 0.15-0.47) for those who had received second vaccinations and 88% for those who had completed third vaccinations (aRR=0.12; 95% CI: 0.06-0.24) compared to the subjects that were unvaccinated. In addition, the relative risk was estimated by stratification according to the type of variant and age. In the Delta variant group, the preventive effects of the vaccine were 85% (aRR=0.15; 95% CI: 0.06-0.33) for those who had received second vaccinations and 94% for those who had received third vaccinations (aRR=0.06; 95% CI: 0.01-0.43). In the Omicron variant group, the preventive effects of the vaccine were 84% (aRR=0.16; 95% CI: 0.06-0.38) for those who had received third vaccinations. Among those aged 60-74 years, the vaccine effect was 92% (aRR=0.08; 95% CI: 0.01-0.91) for those who had received second vaccinations, and 72% (aRR=0.28; 95% CI: 0.15-0.53) among those aged 75 years and older. Furthermore, the vaccine effect was 85% (aRR=0.15; 95% CI: 0.07-0.32) for those who had received third vaccinations (Table 7).

				Vaccinate	ed groups		
0.1	Unvaccinated	First va	accination	Second	vaccination	Third v	accination
Category	group	Relative Risk (95% Cl)	Adjusted Relative Risk <sup>a</sup> (95% Cl)	Relative Risk (95% CI)	Adjusted Relative Riska (95% Cl)	Relative Risk (95% CI)	Adjusted Relative Risk <sup>a</sup> (95% CI)
Total	Ref.	1.26 (0.77–2.06)	1.08 (0.58–1.98)	0.45 (0.36–0.57)	0.62 (0.47-0.81)	0.68 (0.55-0.85)	0.41 (0.31–0.55)
Variants							
Delta	Ref.	0.68 (0.35-1.33)	0.95 (0.47-1.91)	0.41 (0.31–0.54)	0.56 (0.42–0.76)	0.13 (0.09-0.18)	0.17 (0.12–0.26)
Omicron	Ref.	1.58 (0.55-4.56)	2.14 (0.68–6.76)	0.48 (0.27–0.84)	0.81 (0.44-1.49)	0.52 (0.31–0.85)	1.46 (0.84–2.55)
Age group							
60-74 y	Ref.	2.31 (0.74–7.20)	0.84 (0.21-3.45)	0.46 (0.28-0.77)	0.69 (0.38-1.27)	0.67 (0.41-1.07)	0.29 (0.15–0.55)
≥ 75 y	Ref.	1.76 (0.86–3.58)	1.12 (0.50–2.56)	0.57 (0.42–0.77)	0.49 (0.34–0.69)	1.08 (0.80-1.45)	0.42 (0.29–0.61)

Table 5. Relative risk of the incidence rates of the unvaccinated group versus vaccinated groups

<sup>a</sup> Adjusted for sex, age, class, variants, and vaccination status

	Delta				Omicron		Delta vs	Delta vs. Omicron		
	Infected (n)	n	%	Infected (n)	n	%	Relative Risk (95% Cl)	Adjusted Relative Risk <sup>a</sup> (95% CI)		
Total	358	62	17.32	683	36	5.27	0.27 (0.17–0.41)	0.52 (0.32-0.87)		
Sex										
Male	117	23	19.66	186	6	3.23	0.14 (0.05–0.37)	0.33 (0.12-0.91)		
Female	241	39	16.18	497	30	6.04	0.33 (0.20–0.55)	0.63 (0.35-1.14)		
Age group							0.07	0.17		
≤ 59 y	48	5	10.42	119	1	0.84	0.07 (0.01-0.64)	0.17 (0.01-3.20)		
60-74 y	86	5	5.81	162	4	2.47	0.41 (0.11-1.57)	1.35 (0.26-7.02)		
≥ 75 y	224	52	23.21	402	31	7.71	0.81 (0.51–1.28)	0.49 (0.28–0.84)		
Class										
Patients	284	61	21.48	537	36	6.70	0.26 (0.17–0.41)	0.52 (0.32–0.86)		
Workers	74	1	1.35	146	0	0.00	-	-		
Vaccination status										
Unvaccinated	146	48	32.88	81	14	17.28	0.43 (0.22–0.84)	0.42 (0.21–0.83)		
First vaccination	14	5	35.71	29	2	6.90	0.13 (0.02–0.81)	0.06 (0.01-0.48)		
Second vaccinations	154	8	5.19	114	10	8.77	1.75 (0.67–4.60)	1.25 (0.46-3.39)		
Third vaccinations	44	1	2.27	459	10	2.18	0.96 (0.12-7.66)	0.89 (0.10-7.35)		

#### Table 6. Relative risk of the fatality rate of the Omicron variant versus the Delta variant

<sup>a</sup> Adjusted for sex, age, class, and vaccination status

#### Table 7. Comparative analysis of the fatality rate between vaccinated and unvaccinated people

				De	ath			
		First va	accination	Second v	accinations	Third vaccinations		
Category	Unvaccinated	Relative Risk (95% Cl)	Adjusted Relative Risk <sup>a</sup> (95% Cl)	Relative Risk (95% CI)	Adjusted Relative Risk <sup>a</sup> (95% Cl)	Relative Risk (95% CI)	Adjusted Relative Risk <sup>a</sup> (95% Cl)	
Total	Ref.	0.52 (0.22-1.22)	0.71 (0.29–1.75)	0.19 (0.11-0.34)	0.26 (0.15-0.47)	0.06 (0.03-0.12)	0.12 (0.06-0.24)	
Variants								
Delta	Ref.	1.13 (0.36–3.57)	1.20 (0.35-4.06)	0.11 (0.05–0.25)	0.15 (0.06–0.33)	0.05 (0.01–0.36)	0.06 (0.01-0.43)	
Omicron	Ref.	0.35 (0.08–1.67)	0.39 (0.08–1.87)	0.46 (0.19-1.10)	0.56 (0.23-1.34)	0.11 (0.05–0.25)	0.16 (0.06-0.38)	
Age group								
60-74 y	Ref.	1.33 (0.23–7.74)	1.15 (0.16-8.19)	0.10 (0.01-0.83)	0.08 (0.01-0.91)	-	_	
75 y or older	Ref.	0.53 (0.19-1.46)	0.69 (0.24–1.96)	0.26 (0.14-0.49)	0.28 (0.15–0.53)	0.10 (0.05-0.21)	0.15 (0.07–0.32)	

<sup>a</sup> Adjusted for sex, age, class, variants, and vaccination status

# Conclusion

The incidence and fatality rates of COVID-19 were analyzed according to the type of variant and vaccination status of 2,588 patients and workers in nine LTCFs where Delta and Omicron variants were confirmed between October 23, 2021, and February 18, 2022. The incidence rate of the Omicron variant was higher than that of the Delta variant, but the fatality rate was lower. In the analysis of the effect of vaccination according to vaccination status, the incidence and fatality rates were lower in those who had completed second or third vaccinations compared to those who were unvaccinated in the Delta variant group. In the Omicron variant group, the fatality rate was lower in those who had received three vaccinations compared to those who were unvaccinated. Omicron variants have also changed over time and can be classified into four categories: BA.1, BA1.1, BA.2 (stealth Omicron), and BA.3. As of March 4, 2022, the BA.2 variant became the most dominant in the ROK. Public Health England reported that the difference in vaccine effectiveness for the existing Omicron and stealth Omicron variants was about 3% to 6% over time after vaccination, and there was no significant difference [9]. However, the transmissibility of COVID-19 appears to be increasing as new variants present. Therefore, it is necessary to conduct a timely risk assessment for new variants and minimize harm. To achieve this, it is necessary to identify the characteristics of the new variant virus, such as the incubation period, generation period, transmission period, infection reproduction number, asymptomatic transmission, and air transmission, incidence rate, and secondary incidence, etc. This study analyzed the incidence and fatality rates of the Omicron variant versus the Delta variant and confirmed the high incidence and low fatality rates of the Omicron variant, which

showed similar trend other domestic and foreign studies. The vaccine prevention effect for Omicron variant decreased with the pandemic of the Omicron variant. However, the preventive effect for severe cases was maintained for a long time. These results are consistent with our study [7]. Although the fatality rate of the Omicron variant is lower than that of the Delta variant, the number of confirmed cases has been increasing due to the high incidence rate. Accordingly, the number of severe cases and deaths from COVID-19 has also been increasing. Therefore, it is necessary to prevent and prepare for the spread of new variants such as Omicron. This analysis can be further developed and supplemented to identify the virus characteristics of new variants in the future. Moreover, we expect these results to be utilized as evidence for policy decisions related to new variants of COVID-19.

#### ① What is previously known?

Compared to the Delta variant, the Omicron variant is characterized by a high incidence rate and low fatality rate.

#### 2 What is newly learned?

The differences in the incidence and fatality rates of the Omicron versus Delta variants in long term care facility in the Republic of Korea are presented in detail. In addition, we present the effect of vaccination against each variant.

#### ③ What are the implications?

The high incidence rate of the Omicron variant has been increasing the mortality rate in the Republic of Korea, despite the low fatality rate associated with the Omicron variant. Accordingly, it is necessary to prevent and prepare for the spread of new variants such as Omicron. Our results can be used as a reference for preparing a response system when new variants present.

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## **Conflict of Interest**

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

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