# 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 ( $95 \% \mathrm{Cl}$ : 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\% Cl: 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\% Cl: 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.

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

| Category | Incheon <br> A LTCF | Gyeonggi B LTCF | Gwangju C LTCF | Gyeongju D LTCF | Daegu E LTCF | $\begin{aligned} & \text { Daegu } \\ & \text { F LTCF } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 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 <br> Workers: 146 | Patients: 113 <br> Workers: 80 | Patients: 47 <br> Workers: 20 | Patients: 151 <br> Workers: 97 | Patients: 161 <br> Workers: 103 | Patients: 269 <br> 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: <br> Dec. 24 <br> 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\% <br> Patients: 13.5\% <br> Workers: 7.5\% | Total 10.9\% <br> Patients: 10.6\% <br> Workers: 11.3\% | Total 41.8\% <br> Patients: 55.3\% <br> Workers: 10.0\% | Total 21.4\% <br> Patients: 33.1\% <br> Workers: 3.1\% | Total 31.1\% <br> Patients: 39.8\% <br> Workers: $17.5 \%$ | Total 29.5\% <br> Patients: 39.8\% <br> Workers: 15.6\% |
| Death ( n ) | 8 | 2 | 5 | 8 | 9 | 29 |

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

| Category | Gwangju G LTCF | Gwangju H LTCF | Busan <br> I LTCF |
| :---: | :---: | :---: | :---: |
| Variant | Omicron | Omicron | Omicron |
| Facilities | Five floors of wards | Four floors of wards | - |
| Population (n) | Patients: 397 <br> Workers: 233 | Patients: 64 <br> Workers: 23 | Patients: 183 <br> Workers: 117 |
| Vaccination status <br> (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 <br> 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\% <br> Patients: 84.4\% <br> Workers: 34.8\% | $\begin{gathered} \text { Total 37.9\% } \\ \text { Patients: } 39.1 \% \\ \text { Workers: } 34.8 \% \end{gathered}$ | Total 78.0\% <br> Patients: 96.7\% <br> 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 viralvector 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 the subjects in long term care facility (LTCFs) by variant

| Category | Delta variant ( n , \%) |  |  |  |  |  | Omicron variant (n, \%) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Total |  | Confirmed |  | Death |  | Total |  | Confirmed |  | Death |  |
| 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 group |  |  |  |  |  |  |  |  |  |  |  |  |
| $\leq 59 \mathrm{y}$ | 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 |
| $\geq 75 \mathrm{y}$ | 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 |
| Vaccination status |  |  |  |  |  |  |  |  |  |  |  |  |
| Unvaccinated | 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 |
| Second $\leq 90 \mathrm{~d}$ | 143 | 21.47 | 40 | 25.97 | 4 | 50 | 52 | 28.89 | 29 | 25.44 | 1 | 10.00 |
| $\geq 90 \mathrm{~d}$ | 527 | 79.13 | 119 | 77.27 | 4 | 50 | 128 | 71.11 | 86 | 75.44 | 9 | 90.00 |
| Third $\leq 90 \mathrm{~d}$ | 519 | 33.04 | 44 | 12.29 | 1 | 1.61 | 700 | 68.83 | 459 | 67.20 | 10 | 27.78 |
| Vaccines type ${ }^{\text {a }}$ |  |  |  |  |  |  |  |  |  |  |  |  |
| Second vaccination |  |  |  |  |  |  |  |  |  |  |  |  |
| Viral-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 vaccination |  |  |  |  |  |  |  |  |  |  |  |  |
| Viral-mRNA | 486 | 93.64 | 34 | 77.27 | 1 | 100 | 646 | 92.29 | 422 | 91.94 | 10 | 100 |
| mRNA-mRNA | 27 | 5.20 | 5 | 11.36 | 0 | 0 | 47 | 6.71 | 32 | 6.97 | 0 | 0.00 |
| Mixed-mRNA | 2 | 0.39 | 0 | 0 | 0 | 0 | 7 | 1.00 | 4 | 0.87 | 0 | 0.00 |

[^0]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 ( $95 \% \mathrm{CI}: 9.34-25.16$ ), 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 $=0.62 ; 95 \% \mathrm{CI}: 0.47-0.81$ ) for those who had received second vaccinations and $59 \%(a R R=0.41 ; 95 \% \mathrm{CI}: 0.31-0.55)$ 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 $44 \%(a R R=0.56 ; 95 \% \mathrm{CI}: 0.42-0.76)$ of those who had received second vaccinations and $83 \%(a R R=0.17 ; 95 \%$ CI: $0.12-$ 0.26 ) 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. Relative risk of the incidence rates of the Delta variant versus the Omicron variant

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

[^1]$95 \%$ CI: 0.15-0.55). Among those over 75 years old, the vaccine was effective in $51 \%(a R R=0.49 ; 95 \% \mathrm{CI}: 0.34-0.69)$ of those who had received second doses and $58 \%(a R R=0.42 ; 95 \% \mathrm{CI}$ : 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 $48 \%$ ( $\mathrm{aRR}=0.52$; 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 ( $\mathrm{aRR}=0.33 ; 95 \% \mathrm{CI}: 0.12-0.91$ ), $51 \%$ for those 75 years or older ( $\mathrm{aRR}=0.49 ; 95 \% \mathrm{CI}: 0.28-0.84$ ) and $48 \%$ for Patients of nursing homes ( $\mathrm{aRR}=0.52$; $95 \% \mathrm{CI}: 0.32-0.86$ ). 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 $74 \%$ ( $\mathrm{aRR}=0.26$; $95 \% \mathrm{CI}: 0.15-0.47$ ) for those who had received second vaccinations and $88 \%$ for those who had completed third vaccinations ( $\mathrm{aRR}=0.12 ; 95 \% \mathrm{CI}: 0.06-0.24$ ) 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 $85 \%(a R R=0.15 ; 95 \% \mathrm{CI}: 0.06-0.33$ ) for those who had received second vaccinations and $94 \%$ for those who had received third vaccinations ( $\mathrm{aRR}=0.06 ; 95 \% \mathrm{CI}: 0.01-0.43$ ). 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 $72 \%$ ( $\mathrm{aRR}=0.28 ; 95 \% \mathrm{CI}$ : $0.15-0.53$ ) among those aged 75 years and older. Furthermore, the vaccine effect was $85 \%(a R R=0.15 ; 95 \% \mathrm{CI}: 0.07-0.32)$ for those who had received third vaccinations (Table 7).

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

| Category | Unvaccinated group | Vaccinated groups |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | First vaccination |  | Second vaccination |  | Third vaccination |  |
|  |  | $\begin{aligned} & \text { Relative Risk } \\ & (95 \% \mathrm{Cl}) \end{aligned}$ | Adjusted Relative Risk ${ }^{\text {a }}$ ( $95 \% \mathrm{Cl}$ ) | Relative Risk (95\% CI) | Adjusted Relative Riska (95\% CI) | Relative Risk (95\% CI) | Adjusted Relative Risk ${ }^{\text {a }}$ (95\% CI) |
| Total | Ref. | $\begin{gathered} 1.26 \\ (0.77-2.06) \end{gathered}$ | $\begin{gathered} 1.08 \\ (0.58-1.98) \end{gathered}$ | $\begin{gathered} 0.45 \\ (0.36-0.57) \end{gathered}$ | $\begin{gathered} 0.62 \\ (0.47-0.81) \end{gathered}$ | $\begin{gathered} 0.68 \\ (0.55-0.85) \end{gathered}$ | $\begin{gathered} 0.41 \\ (0.31-0.55) \end{gathered}$ |

## Variants

|  |  | 0.68 | 0.95 | 0.41 | 0.56 | 0.13 | 0.17 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Delta | Ref. | $(0.35-1.33)$ | $(0.47-1.91)$ | $(0.31-0.54)$ | $(0.42-0.76)$ | $(0.09-0.18)$ | $(0.12-0.26)$ |
|  |  | 1.58 | 2.14 | 0.48 | 0.81 | 0.52 | 1.46 |
| Omicron | Ref. | $(0.55-4.56)$ | $(0.68-6.76)$ | $(0.27-0.84)$ | $(0.44-1.49)$ | $(0.31-0.85)$ | $(0.84-2.55)$ |

## Age group

| $60-74 \mathrm{y}$ | Ref. | 2.31 | 0.84 | 0.46 | 0.69 | 0.67 | 0.29 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $(0.74-7.20)$ | $(0.21-3.45)$ | $(0.28-0.77)$ | $(0.38-1.27)$ | $(0.41-1.07)$ | $(0.15-0.55)$ |
| $\geq 75 \mathrm{y}$ | Ref. | 1.76 | 1.12 | 0.57 | 0.49 | 1.08 | 0.42 |
|  |  | $(0.86-3.58)$ | $(0.50-2.56)$ | $(0.42-0.77)$ | $(0.34-0.69)$ | $(0.80-1.45)$ | $(0.29-0.61)$ |

[^2]Table 6. Relative risk of the fatality rate of the Omicron variant versus the Delta variant

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

${ }^{\text {a }}$ Adjusted for sex, age, class, and vaccination status

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

| Category | Unvaccinated | Death |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | First vaccination |  | Second vaccinations |  | Third vaccinations |  |
|  |  | Relative Risk (95\% CI) | Adjusted Relative Risk ${ }^{\text {a }}$ (95\% CI) | Relative Risk (95\% CI) | Adjusted Relative Risk ${ }^{\text {a }}$ (95\% CI) | Relative Risk (95\% CI) | Adjusted Relative Risk ${ }^{\text {a }}$ (95\% CI) |
| Total | Ref. | $\begin{gathered} 0.52 \\ (0.22-1.22) \end{gathered}$ | $\begin{gathered} 0.71 \\ (0.29-1.75) \end{gathered}$ | $\begin{gathered} 0.19 \\ (0.11-0.34) \end{gathered}$ | $\begin{gathered} 0.26 \\ (0.15-0.47) \end{gathered}$ | $\begin{gathered} 0.06 \\ (0.03-0.12) \end{gathered}$ | $\begin{gathered} 0.12 \\ (0.06-0.24) \end{gathered}$ |
| Variants |  |  |  |  |  |  |  |
| Delta | Ref. | $\begin{gathered} 1.13 \\ (0.36-3.57) \end{gathered}$ | $\begin{gathered} 1.20 \\ (0.35-4.06) \end{gathered}$ | $\begin{gathered} 0.11 \\ (0.05-0.25) \end{gathered}$ | $\begin{gathered} 0.15 \\ (0.06-0.33) \end{gathered}$ | $\begin{gathered} 0.05 \\ (0.01-0.36) \end{gathered}$ | $\begin{gathered} 0.06 \\ (0.01-0.43) \end{gathered}$ |
| Omicron | Ref. | $\begin{gathered} 0.35 \\ (0.08-1.67) \end{gathered}$ | $\begin{gathered} 0.39 \\ (0.08-1.87) \end{gathered}$ | $\begin{gathered} 0.46 \\ (0.19-1.10) \end{gathered}$ | $\begin{gathered} 0.56 \\ (0.23-1.34) \end{gathered}$ | $\begin{gathered} 0.11 \\ (0.05-0.25) \end{gathered}$ | $\begin{gathered} 0.16 \\ (0.06-0.38) \end{gathered}$ |
| Age group |  |  |  |  |  |  |  |
| 60-74 y | Ref. | $\begin{gathered} 1.33 \\ (0.23-7.74) \end{gathered}$ | $\begin{gathered} 1.15 \\ (0.16-8.19) \end{gathered}$ | $\begin{gathered} 0.10 \\ (0.01-0.83) \end{gathered}$ | $\begin{gathered} 0.08 \\ (0.01-0.91) \end{gathered}$ | - | - |
| 75 y or older | Ref. | $\begin{gathered} 0.53 \\ (0.19-1.46) \end{gathered}$ | $\begin{gathered} 0.69 \\ (0.24-1.96) \end{gathered}$ | $\begin{gathered} 0.26 \\ (0.14-0.49) \end{gathered}$ | $\begin{gathered} 0.28 \\ (0.15-0.53) \end{gathered}$ | $\begin{gathered} 0.10 \\ (0.05-0.21) \end{gathered}$ | $\begin{gathered} 0.15 \\ (0.07-0.32) \end{gathered}$ |

[^3]
## 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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[^4]
[^0]:    ${ }^{a}$ Viral-vector: AstraZenca, Janssen / mRNA: Moderna, Pfizer

[^1]:    ${ }^{\text {a }}$ Adjusted for sex, age, class, and vaccination status

[^2]:    ${ }^{\text {a }}$ Adjusted for sex, age, class, variants, and vaccination status

[^3]:    ${ }^{\text {a }}$ Adjusted for sex, age, class, variants, and vaccination status

[^4]:    This article has been translated from the Public Health Weekly Report (PHWR) Volume 15, Number 16, 2022.

