

## Abstract

## Outbreak of SARS-CoV-2 Breakthrough Infections in Adult Day Service Center and Household Secondary Transmissions with Delta Variant

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Adult Day Services Center (ADSC) provide social or health services to adults ages 65 and over. Now, ADSC administrators, staff, and participants nearly 80% have been vaccinated against Coronavirus Disease-19 (COVID-19). Vaccination can use to help maintain healthy environments and operations and lower the risk of COVID-19 spread in ADSC.

This survey was conducted to identify the pattern of COVID-19 cluster outbreaks in in ADSCs, the effectiveness of vaccination, and the risk factors for COVID-19 spreading.

A cluster case occurred in an ADSC between 10 August to 24 August 2021 in Jeju City, Korea. The case included 58 individuals composed of ADSC patients, staff and household members. This survey analyzed the general characteristics of confirmed cases and contacts, the clinical features of confirmed cases, the characteristics of breakthrough infections, and secondary attack rates in households through epidemiological investigation.

After the index patient was confirmed on 10 August 2021, 25 out of 58 ADSC individuals, and 14 household members and acquaintances were confirmed by 30 August. This resulted in a 43.12% incidence rate in the facility and a 25.5% incidence rate in secondary attacks in households (12 patients). From the analysis of genomic variance, it was confirmed that 13 of the confirmed patients were SARS-CoV-2 virus, delta variants.

Among the ADSC individuals, 96.6% (56 individuals) were fully vaccinated with the BNT162b2 mRNA COVID-19 vaccine. The vaccination periods of all fully vaccinated individuals had elapsed an average of 104 days (80 to 117 days) and the breakthrough rate of infection was 42.9% in fully vaccinated individuals.

This survey concluded that an epidemic could occur under conditions of continuous exposure to the delta variant, even in populations with a high vaccination rate. Furthermore, additional transmission is possible by infected individuals of breakthrough infections.

Therefore, it is important to: conduct immediate tests for suspected symptoms regardless of vaccination history; achieve full vaccinations for new patients and staff members; strengthen access management; wear masks and follow personal hygiene etiquette; and ensure proper ventilation etc. However, considering the characteristics of ADSCs where individuals are exposed to high facility density, enclosed environments, high age groups, underlying diseases, these findings cannot be generalized. This survey recommended supplementary quarantine measures for related facilities.

**Keywords:** Coronavirus Disease-19 (COVID-19), Adult Day Service Center (ADSC), Vaccination of COVID-19, Breakthrough infection.

**Table 1.** Characteristics of cases and non-cases in a COVID-19 outbreak caused by the SARS-CoV-2 delta variant in an Adult day care center, Jeju city, Republic of Korea, August 2021

Characteristics	COVID-19 case (n=25)		Non-COVID-19 case (n=33)		Total (n=58)	
	n	%	n	%	n	%
<b>Case</b>						
Participant	22	(88.0)	20	(60.6)	42	(72.4)
Staff	3	(12.0)	13	(39.4)	16	(27.6)
<b>Gender</b>						
Female	18	(72.0)	24	(72.7)	42	(72.4)
Male	7	(28.0)	9	(27.3)	16	(27.6)
<b>Age group (years)</b>						
≤49	1	(4.0)	2	(6.1)	3	(5.2)
50-59	2	(8.0)	10	(30.3)	12	(20.7)
60-69	0	(0.0)	3	(9.1)	3	(5.2)
70-79	6	(24.0)	4	(12.1)	10	(17.2)
80-89	12	(48.0)	8	(24.2)	20	(34.5)
≥90	4	(16.0)	6	(18.2)	10	(17.2)
<b>Vaccination status</b>						
Fully vaccinated*	24	(96.0)	32	(97.0)	56	(96.6)
Unvaccinated	1	(4.0)	1	(3.0)	2	(3.4)
<b>Outcome</b>						
Symptomatic infections	12	(48.0)	—	—	12	(20.7)
Fatal outcome	1	(4.0)	—	—	1	(1.7)

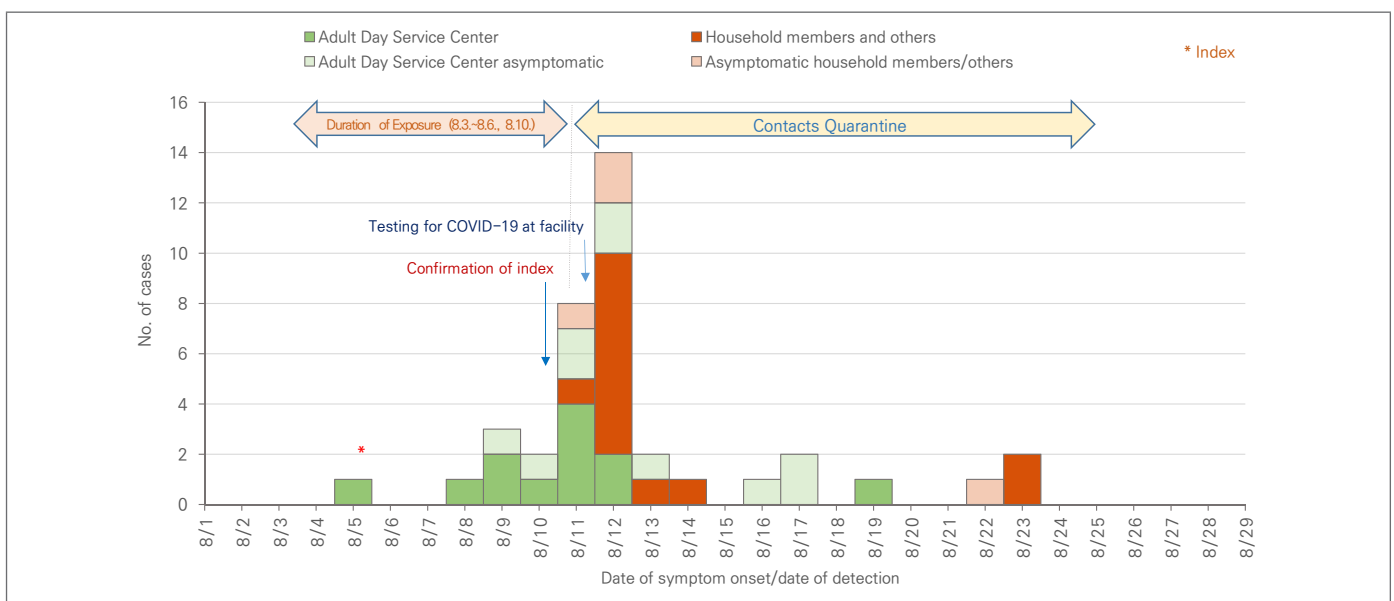
\*Interval post 2<sup>nd</sup> dose: mean 140.0days (range 80-117 days)**Figure 1.** Epidemic curve of SARS-CoV-2 delta variant outbreak in an adult day service center

Table 2. COVID-19 cases by vaccination status

Cases	Fully vaccinated (n=24)			Unvaccinated (n=1)			Total (n=25)		
	Vaccinated	COVID-19 case	%	Vaccinated	COVID-19 case	%	Vaccinated	COVID-19 case	%
Total	56	24	(42.9)	2	1	(50.0)	58	25	(43.1)
Participant	40	21	(52.5)	2	1	(50.0)	42	22	(52.4)
Staff	16	3	(18.8)	–		–	16	3	(18.8)

Table 3. Secondary attack rate (SAR) to household members by vaccination status

Characteristics		Vaccination for household contacts											
		Total			Fully vaccinated			Partially vaccinated			Unvaccinated		
		Additional COVID-19 case	Household contacts	%	Additional COVID-19 case	Household contacts	%	Additional COVID-19 case	Household contacts	%	Additional COVID-19 case	Household contacts	%
Infector	Total (n=7)	12	47	25.5	1	8	12.5	6	21	28.6	5	18	27.8
	Fully vaccinated (n=6)	11	46	23.9	1	8	12.5	5	20	25.0	5	18	27.8
	Unvaccinated (n=1)	1	1	100.0	–	–	–	1	1	100.0	–	–	–