Abstract

Update: Current status and Characteristics of Variant Virus Outbreak in Korea in March 2021

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Regarding the Coronavirus Disease 2019 (COVID-19) in Korea, the government intends to evaluate the domestic situation and respond to variant viruses by checking current status, dynamics, and the clinical characteristics of the COVID-19 on a monthly basis. COVID-19 virus variant surveillance was conducted through full-length genome analysis and spike protein gene analysis for positive samples of confirmed cases related to various domestic outbreaks and imported cases.

The epidemiological and clinical characteristics were analyzed using initial and in-depth epidemiological investigation results reported through the Korea Disease Control and Prevention Agency's (KDCA) COVID-19 information management system; the information system for managing confirmed patients (HIRAe), wired monitoring. Clinical characteristics such as severity and the occurred of group cases were analyzed.

Among the number of confirmed cases during the March (13,288), 12.0% of isolates (1,589) was laboratory tested for identification of variants of SARS-CoV-2. A total of 113 accounting for 7.1% of the tested were confirmed as Variants of Concern (VOC). The rate of sequenced isolates of March were increased by 33% compared to that of Feburary. On the other hand, the detection rate of VOCs of March were decreased by 4.3% compared to that of February.

A total of 330 patients of Variants of Concern (VOCs) have been confirmed in Korea to April 5, 2021. The 330 VOC cases were divided into three groups: 501Y.V1, 501Y.V2 and 501Y.V3. 280 cases (84.9%) having the 501Y.V1, 42 cases (12.7%) having the 501Y.V2 (VOC originating from the South Africa), and 8 cases (2.4%) having the 501Y.V3 (VOC originating from the Brazil).

Among the 330 cases, there were 204 imported cases (61.8%). The patients' average age was 38.1, By age group, people aged 71 cases (21.5%) each in their 20s, 30s. 233 cases (70.6%) were Korean nationals. 192 cases (58.2%) were symptomatic at diagnosis, 69 cases (20.9%) was mild respiratory symptoms with fever. Most symptoms of VOC patients in Korea were mild, but 9 of the 501Y.V1 (VOC originating from the UK), and 1 of the 501Y.V2 (VOC originating from the South Africa) patients were severe/critical (including one death). The rate of severe/critical symptoms was 3.0%, and the fatality rate was 0.3%.

A total of 7 VOCs-related group cases were confirmed in March 2021, with 153 confirmed cases (32 laboratory confirmed cases, 121 epidemiological cases) lower than February 910 group cases, 195 confirmed cases [65 Laboratory confirmed cases, 130 epidemiological cases]). There were a total of 19 VOCs-related group cases and 394 confirmed cases (117 laboratory confirmed cases and 277 epidemiological related cases). By gender, there were 223 male cases (56.6%) and 78 female cases (19.8%) aged 20-29 years, and 128 (32.5%) cases were reported in Gyeonggi Province, followed by 120 cases (30.5%) reported in Ulsan Metropolitan City.

Keywords: Coronavirus Disease-19 (COVID-19), Variant Of Concern (VOC), Variant of Interest (VOI), Whole Genome Sequencing, Clinical characteristic, Group cases

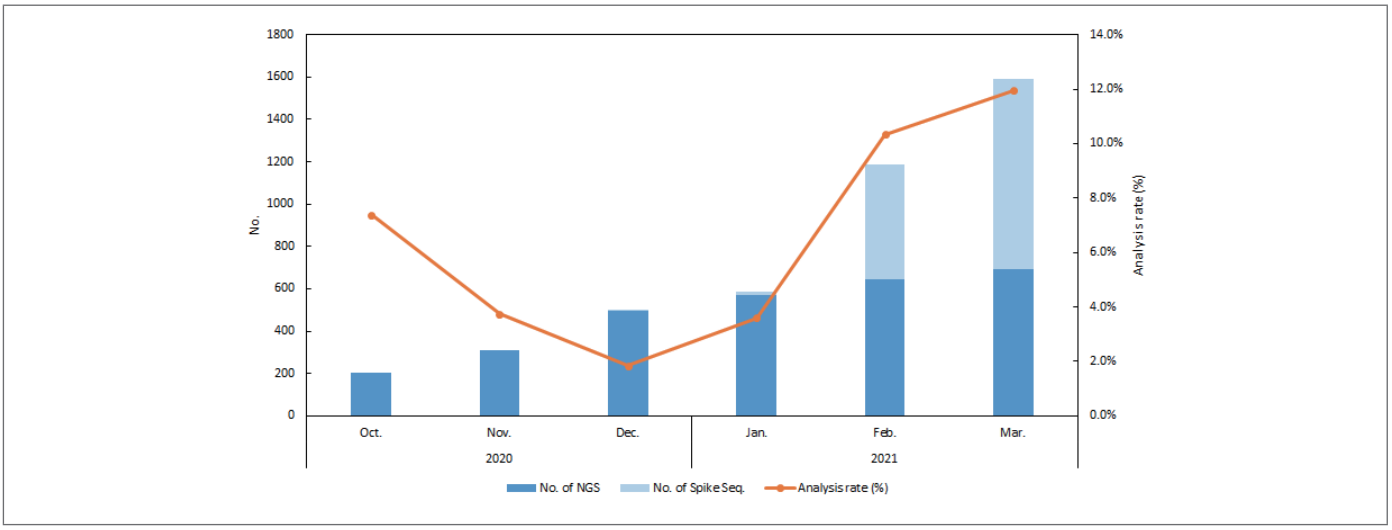


Figure 1. The number of sequenced Coronavirus Disease-19 (COVID-19) virus and the rate of sequenced isolates among the confirmed cases

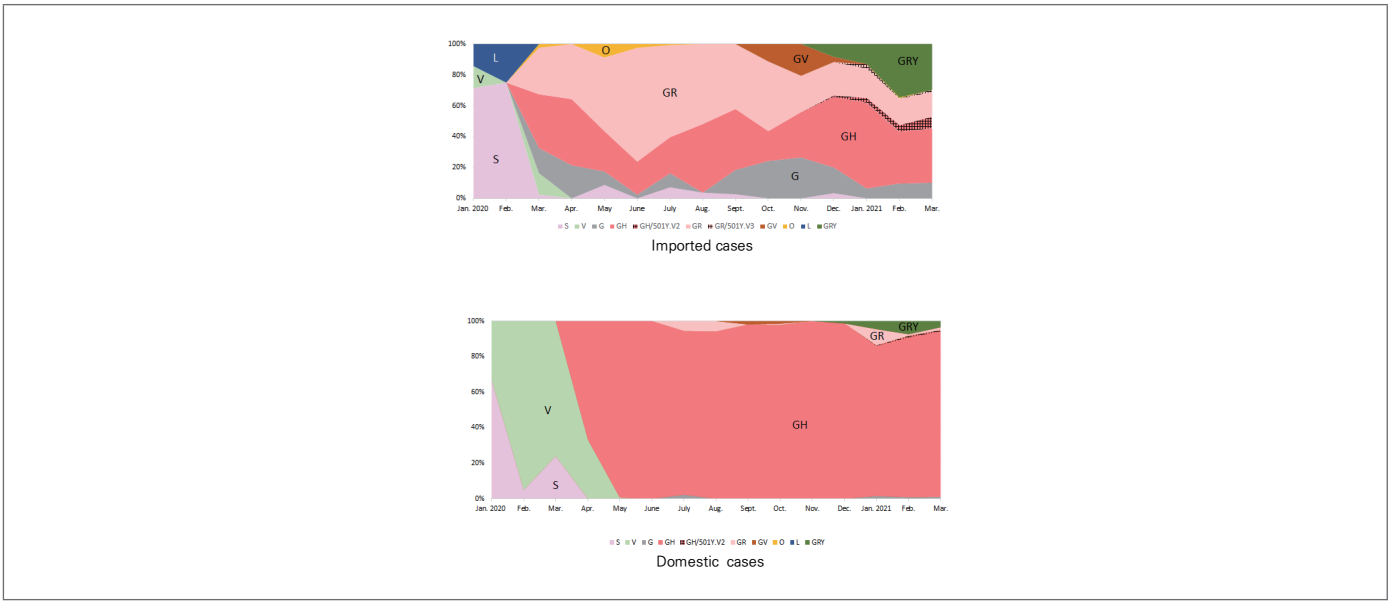
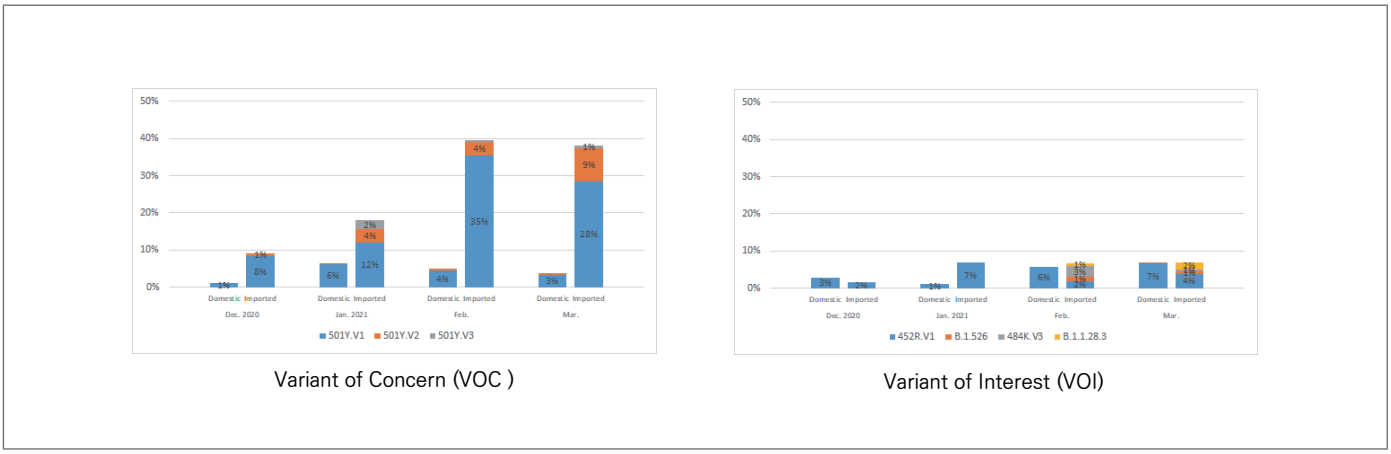


Figure 2. The distribution of the clades of Coronavirus Disease-19 (COVID-19) virus in domestic and imported cases

Table 1. The regional occurrence of Coronavirus Disease-19 (COVID-19) variants in the Republic of Korea (Up to April 5th, 2021)

		Region		Number of VOC (Detection rate, %)*				
				Total	Dec. 2020	Jan. 2021	Feb. 2021	Mar. 2021
Variant of Concern (VOC)	Total number of VOC			330 (8.5%)	15 (3.0%)	67 (11.4%)	135 (11.4%)	113 (7.1%)
	501Y.V1 (GRY)		Total	280 (7.2%)	14 (2.8%)	51 (8.7%)	122 (10.3%)	93 (5.9%)
		Domestic	Subtotal	116 (3.7%)	4 (1.1%)	21 (6.2%)	43 (4.5%)	48 (3.4%)
			Capital	42 (2.7%)	4 (1.8%)	8 (4.8%)	14 (3.3%)	16 (2.2%)
			Kyungpook	15 (5.3%)	0 (0.0%)	0 (0.0%)	5 (4.9%)	10 (8.4%)
			Kyungnam	48 (10.9%)	0 (0.0%)	7 (9.5%)	19 (15.7%)	22 (11.6%)
			Honam	11 (3.1%)	0 (0.0%)	6 (11.1%)	5 (3.5%)	0 (0.0%)
			Chungcheong	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
		Imported		164 (21.8%)	10 (8.3%)	30 (12.0%)	79 (35.4%)	45 (28.5%)
	501Y.V2 (GH)		Total	42 (1.1%)	1 (0.2%)	10 (1.7%)	12 (1.0%)	19 (1.2%)
		Domestic		10 (0.3%)	0 (0.0%)	1 (0.3%)	4 (0.4%)	5 (0.3%)
		Imported		32 (4.3%)	1 (0.8%)	9 (3.6%)	8 (3.6%)	14 (8.9%)
	501Y.V3 (GR)		Total	8 (0.2%)	0 (0.0%)	6 (1.0%)	1 (0.1%)	1 (0.1%)
		Domestic		0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
		Imported		8 (1.1%)	0 (0.0%)	6 (2.4%)	1 (0.4%)	1 (0.6%)
Variant of Interest (VOI)	Total number of VOI			211 (5.5%)	13 (2.6%)	21 (3.6%)	69 (5.8%)	108 (6.8%)
	452R.V1 (GH)		Total	193 (5.0%)	13 (2.6%)	21 (3.6%)	59 (5.0%)	100 (6.2%)
		Domestic	Subtotal	164 (5.3%)	11 (2.9%)	4 (1.2%)	55 (5.7%)	94 (6.4%)
			Capital	54 (3.5%)	11 (5.0%)	3 (1.8%)	11 (2.6%)	29 (3.9%)
			Kyungpook	96 (33.9%)	0 (0.0%)	1 (4.5%)	37 (36.3%)	58 (48.7%)
			Kyungnam	4 (0.9%)	0 (0.0%)	0 (0.0%)	1 (0.8%)	3 (1.6%)
			Honam	4 (1.1%)	0 (0.0%)	0 (0.0%)	4 (2.8%)	0 (0.0%)
			Chungcheong	6 (1.2%)	0 (0.0%)	0 (0.0%)	2 (1.1%)	4 (1.6%)
		Imported		29 (3.9%)	2 (1.7%)	17 (6.8%)	4 (1.8%)	6 (3.8%)
	B.1.526 (GH)		Total	6 (0.2%)	0 (0.0%)	0 (0.0%)	3 (0.3%)	3 (0.2%)
		Domestic		2 (0.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (0.1%)
		Imported		4 (0.5%)	0 (0.0%)	0 (0.0%)	3 (1.3%)	1 (0.6%)
	484K.V3 (G)		Total	7 (0.2%)	0 (0.0%)	0 (0.0%)	5 (0.4%)	2 (0.1%)
		Domestic		0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
		Imported		7 (0.9%)	0 (0.0%)	0 (0.0%)	5 (2.2%)	2 (1.3%)
	B.1.1.28.3 (G)		Total	5 (0.1%)	0 (0.0%)	0 (0.0%)	2 (0.2%)	3 (0.2%)
		Domestic		0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
		Imported		5 (0.7%)	0 (0.0%)	0 (0.0%)	2 (0.9%)	3 (1.9%)

* Detection rate of VOC (%) = (number of VOC / number of sequenced virus) ×100



Variant of Concern (VOC)

Variant of Interest (VOI)

Figure 3. Monthly distribution of Coronavirus Disease-19 (COVID-19) variants

Table 2. The routes in which the Coronavirus Disease-19 (COVID-19) variants were identified in the Republic of Korea (Up to April 5th, 2021)

Classification		Route	No. of countries	Countries
Variant of Concern (VOC)	501Y.V1 (GRY)	Domestic	-	A total of 116
		Imported	32	**A total of 164 :** Hungary (37), United Kingdom (19), Poland (14), UAE (12), Pakistan (12), Ghana (10), United States (9), Jordan (8), Philippines (7), France (4), German (3), Serbia (3), Slovakia (2), Iraq (2), Czechia (2), Mongolia (2), Montenegro (2), India (2), Netherlands (1), Ukraine (1), Bahrain (1), Kazakhstan (1), Morocco (1), Maldives (1), Nigeria (1), Norway (1), China (1), Libya (1), Ethiopia (1), Russia (1), Brazil (1), Denmark (1)
	501Y.V2 (GH)	Domestic	-	A total of 10
		Imported	7	**A total of 32 :** Tanzania (8), Bangladesh (5), UAE (4), Mexico (3), South Africa (2), Philippines (2), Equatorial Guinea (1), Cameroon (1), Burundi (1), Zimbabwe (1), Malawi (1), Zambia (1), United States (1), Bahrain (1)
	501Y.V3 (GR)	Domestic	-	-
		Imported	4	**A total of 8 :** Brazil (5), Canada (1), Saudi Arabia (1), United States (1)
Variant of Interest (VOI)	452R.V1 (GH)	Domestic	-	A total of 164
		Imported	2	**A total of 29 :** United States (27), Mexico (2)
	B.1.526 (GH)	Domestic	-	A total of 2
		Imported	1	**A total of 4 :** United States (4)
	484K.V3 (G)	Domestic	-	-
		Imported	4	**A total of 7 :** Nigeria (4), Sudan (1), UAE (1), Cameroon (1)
	B.1.1.28.3 (G)	Domestic	-	-
		Imported	1	**A total of 5 :** Philippines (5)

Table 3. Route of infection and detection of VOCs in Korea

Unit: n (%)

	Total	Dec. 2020				Jan. 2021				Feb. 2021				Mar. 2021			
		Total	501Y. V1	501Y. V2	501Y. V3	Total	501Y. V1	501Y. V2	501Y. V3	Total	501Y. V1	501Y. V2	501Y. V3	Total	501Y. V1	501Y. V2	501Y. V3
Total	330 (100%)	15	14	1	0	67	51	10	6	135	122	12	1	113	93	19	1
Imported cases	204 (61.8%)	11	10	1	0	45	30	9	6	88	79	8	1	60	45	14	1
At entry screening	85 (25.7%)	5	4	1	0	19	13	4	2	36	32	4	0	25	18	6	1
During home quarantine	116 (35.2%)	6	6	0	0	26	17	5	4	49	44	4	1	35	27	8	0
Others*	3 (0.9%)	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0
Locally-acquired cases	126 (38.2%)	4	4	0	0	22	21	1	0	47	43	4	0	53	48	5	0
Contact with confirmed cases	116 (35.2%)	4	4	0	0	21	20	1	0	42	39	3	0	49	44	5	0
Under investigation (unclassified)	10 (3.0%)	0	0	0	0	1	1	0	0	5	4	1	0	4	4	0	0

* Home quarantine exemption

Table 4. Epidemiological characteristics of VOCs in Korea

Unit: n (%)

	Total	501Y.V1	501Y.V2	501Y.V3	*p*-value**
Total	330 (100.0%)	280 (84.9%)	42 (12.7%)	8 (2.4%)	
Gender					
Male	208 (63.0%)	175 (62.5%)	27 (64.3%)	6 (75.0%)	0.758
Female	122 (37.0%)	105 (37.5%)	15 (35.7%)	2 (25.0%)	
Nationality					
Koreans	233 (70.6%)	198 (70.7%)	27 (64.3%)	8 (100.0%)	0.126
Foreigners	97 (29.4%)	82 (29.3%)	15 (35.7%)	0 (0.0%)	
Age group(yrs)					
0-9	17 (5.1%)	14 (5.0%)	3 (7.1%)	0 (0.0%)	
10-19	21 (6.4%)	19 (6.8%)	2 (4.8%)	0 (0.0%)	
20-29	71 (21.5%)	62 (22.1%)	7 (16.7%)	2 (25.0%)	
30-39	71 (21.5%)	57 (20.4%)	11 (26.1%)	3 (37.5%)	
40-49	60 (18.2%)	53 (18.9%)	7 (16.7%)	0 (0.0%)	0.229
50-59	51 (15.5%)	48 (17.1%)	2 (4.8%)	1 (12.5%)	
60-69	29 (8.8%)	19 (6.8%)	8 (19.0%)	2 (25.0%)	
70-79	7 (2.1%)	5 (1.8%)	2 (4.8%)	0 (0.0%)	
80+	3 (0.9%)	3 (1.1%)	0 (0.0%)	0 (0.0%)	
Isolation place					
Residential treatment center	157 (47.6%)	126 (45.0%)	26 (61.9%)	5 (62.5%)	
Hospital	170 (51.5%)	151 (53.9%)	16 (38.1%)	3 (37.5%)	0.518
Home treatment	1 (0.3%)	1 (0.4%)	0 (0.0%)	0 (0.0%)	
Others*	2 (0.6%)	2 (0.7%)	0 (0.0%)	0 (0.0%)	

* Death before COVID-19 confirmation, Unmanaged case; ** χ^2 test

Table 5. Clinical characteristics of VOCs in Korea

Unit: n (%)

	Total	501Y.V1	501Y.V2	501Y.V3	*p*-value*
Total	330 (100.0%)	280 (84.9%)	42 (12.7%)	8 (2.4%)	
Symptom					
Symptomatic	192 (58.2%)	167 (59.6%)	20 (47.6%)	5 (62.5%)	0.327
Asymptomatic	138 (41.8%)	113 (40.4%)	22 (52.4%)	3 (37.5%)	
Symptom classification					
Fever only	28 (8.5%)	17 (6.1%)	9 (21.4%)	2 (25.0%)	0.021
Fever and respiratory symptoms	43 (13.0%)	41 (14.6%)	2 (4.8%)	0 (0.0%)	
Fever and other symptoms	23 (7.0%)	20 (7.1%)	3 (7.1%)	0 (0.0%)	
Respiratory symptoms without fever	69 (20.9%)	64 (22.9%)	3 (7.1%)	2 (25.0%)	
Acute loss of sense of smell or taste	5 (1.5%)	4 (1.4%)	1 (2.4%)	0 (0.0%)	
Others	24 (7.3%)	21 (7.5%)	2 (4.8%)	1 (12.5%)	
Asymptomatic	138 (41.8%)	113 (40.4%)	22 (52.4%)	3 (37.5%)	
Severity					
Death	1 (0.3%)	1 (0.4%)	0 (0.0%)	0 (0.0%)	0.979
Severe/critical	9 (2.7%)	8 (2.9%)	1 (2.4%)	0 (0.0%)	
Milld/ asymptomatic	320 (97.0%)	271 (96.7%)	41 (97.6%)	8 (100.0%)	

* χ^2 test

Table 6. Characteristics of variant of concern (VOC) viruses by group case

		Patient Occurrence Period	Occurrence status			Virus type
			Total	Laboratory confirmed cases	Epidemiological cases	
January	Group 1	1.7–1.29.	38	13	25	501Y.V1
	Group 2	1.29–1.30.	8	7	1	501Y.V1
January subtotal (Group 1 – Group 22)			**46**	**20**	**26**	
February	Group 3	2.10–2.23.	31	7	24	501Y.V1
	Group 4	2.7–2.17.	7	2	5	501Y.V1
	Group 5	2.4–2.5.	5	3	2	501Y.V1
	Group 6	2.3–2.13.	11	3	8	501Y.V1
	Group 7	2.22–2.23.	3	3	0	501Y.V2
	Group 8	2.11–3.1.	62	24	38	501Y.V1
	Group 9	2.16–3.15.	24	1	23	501Y.V1
	Group 10	2.18–3.3.	18	3	15	501Y.V1
	Group 11	2.27–3.21.	25	14	11	501Y.V1
	Group 12	2.24–3.16.	9	5	4	501Y.V1
February subtotal (Group 3 – Group 12)			**195**	**65**	**130**	
March	Group 13	3.6–3.16.	80	12	68	501Y.V1
	Group 14	3.8–3.10.	8	2	6	501Y.V1
	Group 15	3.20–3.23.	6	1	5	501Y.V1
	Group 16	3.17–3.25.	40	9	31	501Y.V1
	Group 17	2.24–3.12.	6	6	0	501Y.V2
	Group 18	3.19–3.21.	5	1	4	501Y.V1
	Group 19	3.21–3.24.	8	1	7	501Y.V1
March subtotal (Group 13 – Group 19)			**153**	**32**	**121**	
Total			**394**	**117**	**277**	

Table 7. Demographic characteristics of patients with variant of concern virus population cases (including epidemiological cases)

Unit: n (fraction, %)

	March	Total
	N (%)	N (%)
Total	153 (100.0)	394 (100.0)
Sex		
Male	90 (58.8)	223 (56.6)
Female	63 (41.2)	171 (43.4)
Age group		
0–9	5 (3.3)	48 (12.2)
10–19	12 (7.8)	33 (8.4)
20–29	42 (27.5)	78 (19.8)
30–39	26 (17.0)	65 (16.5)
40–49	21 (13.7)	48 (12.2)
50–59	22 (14.4)	75 (19.0)
60–69	19 (12.4)	34 (8.6)
70–79	6 (3.9)	10 (2.5)
80+	0 (0.0)	3 (0.8)
Region		
Seoul	9 (5.9)	14 (3.6)
Busan	2 (1.3)	13 (3.3)
Daegu	1 (0.7)	3 (0.8)
Incheon	0 (0.0)	22 (5.6)
Gwangju	0 (0.0)	0 (0.0)
Daejeon	0 (0.0)	0 (0.0)
Ulsan	75 (49.0)	120 (30.5)
Sejong	0 (0.0)	0 (0.0)
Gyeonggi	55 (35.9)	128 (32.5)
Gangwon	0 (0.0)	3 (0.8)
Chungbuk	0 (0.0)	0 (0.0)
Chungnam	0 (0.0)	0 (0.0)
Jeonbuk	0 (0.0)	0 (0.0)
Jeonnam	0 (0.0)	17 (4.3)
Gyeongbuk	0 (0.0)	23 (5.8)
Gyeongnam	11 (7.2)	51 (12.9)
Jeju	0 (0.0)	0 (0.0)