Impact of the COVID-19 Pandemic on Emergency Care for Severe Non-COVID Patients: A Nationwide Retrospective Analysis by Phase

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***Abstract*—Korea was internationally recognized for its successful infection control strategies and healthcare policies during the COVID-19 pandemic. While these efforts helped limit virus transmission, their indirect impact on emergency care for non-COVID critically ill patients remains uncertain. This study aimed to assess how emergency care delivery for severe non-COVID patients changed across different phases of the pandemic using nationwide data. Among COVID-19 patients, the time from symptom onset to Emergency Department (ED) visit steadily decreased from 46.1 hours in the early phase to 25.1 hours in later waves. In contrast, this interval increased for non-COVID critically ill patients, from 18.4 hours pre-pandemic to 20.2 hours during the fourth wave. ED mortality for COVID-19 patients remained low at approximately 0.1%, whereas it increased for non-COVID severe patients from 5.4% pre-pandemic to 6.6–7.6% across the waves. Intensive Care Unit (ICU) admission for COVID-19 patients peaked at 5.8% during the fourth wave, while it declined to 25.8% among non-COVID severe patients in the same period. Despite Korea's effective pandemic response, emergency care for non-COVID critical patients was negatively affected. The prioritization of resources toward COVID-19 care may have contributed to delays and worse outcomes for other high-acuity patients. Future preparedness strategies must ensure balanced resource allocation to maintain essential emergency services for all patients.**

***Keywords-Emergency Care; Resource Allocation; Severe Non-COVID Patients; COVID-19 Pandemic; Health System Impact*.**

I. INTRODUCTION

Korea was internationally recognized for its effective infection control strategies and health system responsiveness during the COVID-19 pandemic. High testing rates, contact tracing, and centralized coordination helped limit virus transmission and sustain healthcare capacity. Despite a relatively high hospital bed availability—12.8 beds per 1,000 population, well above the Organisation for Economic Co-operation and Development (OECD) average of 4.3 [1]—the healthcare system faced resource strain during peak outbreak periods [2].

To meet growing demand, the Korean government designated COVID-19 hospitals, expanded hospital-level autonomy, and provided substantial financial support. While these measures strengthened the pandemic response, they may have unintentionally burdened Emergency Departments (EDs) responsible for treating both COVID-19 and non-COVID critically ill patients.

Particularly for non-COVID patients requiring urgent care, concerns arose over delayed treatment and adverse outcomes due to resource reallocation. In emergency medicine, timely intervention within the "golden hour" is essential for improving survival and recovery [3][4]. Overwhelmed EDs may have compromised care delivery for non-COVID high-acuity cases.

This study aims to evaluate the impact of the COVID-19 pandemic on emergency care for non-COVID critically ill patients in Korea. Using nationwide retrospective data, we assess clinical indicators across pandemic phases to inform future strategies for maintaining balanced emergency care during public health crises.

The remainder of this paper is organized as follows: Section II details the data sources and methodology; Section III presents the results by pandemic phase; Section IV discusses the policy and clinical implications; and Section V concludes with key findings and recommendations.

II. METHODS

This retrospective study included COVID-19 and severe non-COVID patients who visited Level 1 and 2 EDs in Korea from January 2019 to August 2022, using data from the Korean National Emergency Department Information System (NEDIS).

COVID-19 patients were identified as those diagnosed with COVID-19 in the ED or upon hospital discharge. Severe non-COVID patients were defined as individuals

triaged as Level 1 or 2 according to the Korean Triage and Acuity Scale (KTAS).

We compared three clinical indicators: time from symptom onset to ED arrival, Intensive Care Unit (ICU) admission rate, and ED mortality across six COVID-19 pandemic phases [5]: (1) initial outbreak and regional spread (Jan 2020), (2) August 15 Seoul rally surge (Aug 2020), (3) nationwide variant spread (Nov 2020), (4) Delta wave (Jul 2021), (5) Omicron wave (Jan 2022), and (6) Omicron subvariant spread (Jun-Aug 2022).

Chi-square tests analyzed categorical variables, such as ICU admission and mortality rates, while the Kruskal-Wallis test compared continuous variables, including onset-to-ED arrival time. Statistical significance was defined as $p < 0.05$. This approach allowed assessment of temporal changes in emergency care delivery during different stages of the pandemic.

III. RESULTS

A total of 176,650 COVID-19 patients and 1,317,624 severe non-COVID patients were included in the analysis.

Among COVID-19 patients, the time from symptom onset to ED arrival decreased steadily ($p < 0.0001$), from 46.1 hours during the first wave to 25.1 hours by the sixth wave. In contrast, severe non-COVID patients experienced increased delays in ED arrival, with onset-to-arrival time rising from 18.4 hours in the pre-pandemic period to a peak of 20.2 hours during the fourth wave and remaining elevated at 19.2 hours in the sixth wave ($p < 0.0001$).

ED mortality among COVID-19 patients remained consistently low at approximately 0.1% across all phases of the pandemic. However, for severe non-COVID patients, ED mortality increased significantly—from 5.4% in the pre-pandemic period to a range of 6.6% to 7.6% during the pandemic waves ($p < 0.0001$).

Regarding ICU admissions, the rate among COVID-19 patients peaked at 5.8% during the Delta wave (Wave 4). In contrast, ICU admission rates for severe non-COVID patients declined over time, reaching 25.8% during the same wave.

IV. DISCUSSION

This study revealed a divergent trend in emergency care accessibility during the COVID-19 pandemic: while the time from symptom onset to ED arrival decreased for COVID-19 patients, it increased for severe non-COVID patients, accompanied by a rise in ED mortality. These findings suggest that the pandemic placed a substantial burden on the emergency care system, which may have compromised timely treatment for non-COVID critically ill patients.

The observed decline in ICU admission rates among severe non-COVID patients—coinciding with peaks in ICU admissions for COVID-19 patients—indicates that limited critical care resources may have been disproportionately allocated to COVID-19 cases. This resource concentration will likely reduce access for other high-acuity patients requiring intensive care.

Despite efforts to support emergency care, including limiting non-urgent ED visits and funding dedicated personnel, the majority of governmental policies were still predominantly directed toward managing infectious diseases.

Policies including enhanced health insurance reimbursement for COVID-19 care, infrastructure support for isolation units, and the expansion of telemedicine may have inadvertently contributed to delays in ED visits for non-COVID patients.

Previous studies have demonstrated that delays in emergency care are associated with increased mortality among critically ill patients [6][7][8].

Our findings raise concerns about healthcare equity during pandemics, highlighting the need for a more balanced approach in future emergency preparedness planning. Ensuring equitable access to time-sensitive care for all critically ill patients—regardless of infectious status—should be a key priority in designing resilient health systems.

V. CONCLUSION

While Korea's COVID-19 response was widely recognized internationally, the concentrated focus on pandemic-related care produced unintended consequences for non-COVID critically ill emergency patients. These included increased emergency department mortality, prolonged arrival times, and reduced intensive care unit admissions. To safeguard all emergency patients during future health crises, policies must ensure balanced resource allocation across patient groups. Further research is warranted to clarify the long-term impacts on emergency care delivery and patient outcomes.

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TABLE 1 CHARACTERISTICS AND EMERGENCY DEPARTMENT OUTCOMES OF COVID-19 AND SEVERE NON-COVID PATIENTS ACROSS PANDEMIC WAVES

		2019yr	Wave						
			First	Second	Third	Fourth	Fifth	Sixth	p-value
COVID-19 patients	Total		9,838 (100.0)	5,794 (100.0)	14,942 (100.0)	18,044 (100.0)	71,310 (100.0)	56,722 (100.0)	
	Sex								<.0001
	Male		5,101 (51.8)	2,877 (49.7)	7,656 (51.2)	9,116 (50.5)	35,297 (49.5)	26,374 (46.5)	
	Female		4,737 (48.2)	2,917 (50.3)	7,286 (48.8)	8,928 (49.5)	36,013 (50.5)	30,348 (53.5)	
	Age, years		48.1±24.6	51.5±23.9	52.7±23.8	51.2±25.1	45.6±29.9	44.9±28.1	<.0001
	Age Groups								<.0001
	0-1		120 (1.2)	68 (1.2)	143 (1.0)	194 (1.1)	2,102 (2.9)	1,544 (2.7)	
	1-14		802 (8.2)	395 (6.8)	1,000 (6.7)	1,685 (9.3)	15,574 (21.8)	10,038 (17.7)	
	15-64		5,921 (60.2)	3,256 (56.2)	8,207 (54.9)	9,489 (52.6)	28,775 (40.4)	27,741 (48.9)	
	65-		2,995 (30.4)	2,075 (35.8)	5,592 (37.4)	6,676 (37.0)	24,859 (34.9)	17,399 (30.7)	
	Onset-to-ED arrival time, hours		46.1±55.3	44.9±54.9	43.1±54.0	43.5±53.4	31.3±44.0	25.1±34.3	<.0001
	ED LOS, hours		7.7±10.8	7.8±10.6	8.3±10.9	9.2±13.1	6.7±10.2	3.9±6.0	<.0001
	ED death		11 (0.1)	6 (0.1)	12 (0.1)	20 (0.1)	67 (0.1)	14 (0.0)	<.0001
	ICD Admission		766 (7.8)	440 (7.6)	676 (4.5)	1,040 (5.8)	2,857 (4.0)	1,351 (2.4)	<.0001
Severe non-COVID patients	Total	390,102 (100.0)	182,383 (100.0)	86,083 (100.0)	234,699 (100.0)	217,099 (100.0)	139,005 (100.0)	68,253 (100.0)	
	Sex								<.0001
	Male	228,721 (58.6)	107,730 (59.1)	51,075 (59.3)	136,305 (58.1)	124,868 (57.5)	80,424 (57.9)	39,640 (58.1)	
	Female	161,381 (41.4)	74,653 (40.9)	35,008 (40.7)	98,394 (41.9)	92,231 (42.5)	58,581 (42.1)	28,613 (41.9)	
	Age, years	57.1±24.9	59.6±22.9	60.0±22.6	59.9±22.8	58.7±23.7	59.8±23.6	59.1±23.9	<.0001
	Age Groups								<.0001
	0-1	17,212 (4.4)	5,682 (3.1)	2,341 (2.7)	6,162 (2.6)	6,236 (2.9)	4,198 (3.0)	2,073 (3.0)	
	1-14	21,217 (5.4)	5,879 (3.2)	2,684 (3.1)	7,911 (3.4)	8,669 (4.0)	5,538 (4.0)	3,197 (4.7)	
	15-64	172,724 (44.3)	82,519 (45.2)	38,722 (45.0)	104,500 (44.5)	98,551 (45.4)	59,228 (42.6)	29,464 (43.2)	
	65-	178,949 (45.9)	88,303 (48.4)	42,336 (49.2)	116,126 (49.5)	103,643 (47.7)	70,041 (50.4)	33,519 (49.1)	
	Onset-to-ED arrival time, hours	18.4±39.0	18.1±38.8	18.4±38.9	19.4±40.1	20.2±40.6	19.3±40.0	19.2±39.7	<.0001
	ED LOS, hours	6.2±8.8	6.4±8.2	6.3±7.8	6.9±8.6	7.2±9.5	8.2±11.1	7.0±9.2	<.0001
	ED death	21,211 (5.4)	12,338 (6.8)	5,978 (6.9)	15,891 (6.8)	14,391 (6.6)	10,628 (7.6)	4,014 (5.9)	<.0001
	ICD Admission	101,084 (25.9)	51,308 (28.1)	24,654 (28.6)	65,539 (27.9)	55,983 (25.8)	35,144 (25.3)	17,998 (26.4)	<.0001

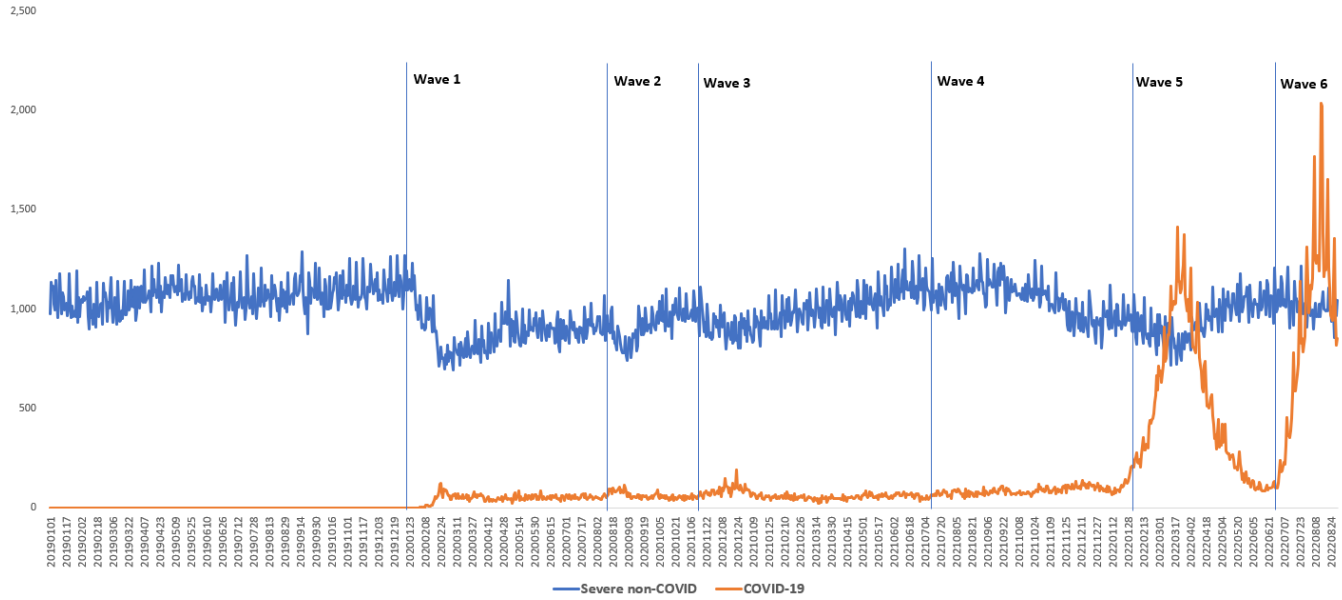

Figure 1 Daily Volume of Emergency Department Visits by COVID-19 Wave Phase (Jan 2019–Aug 2022)

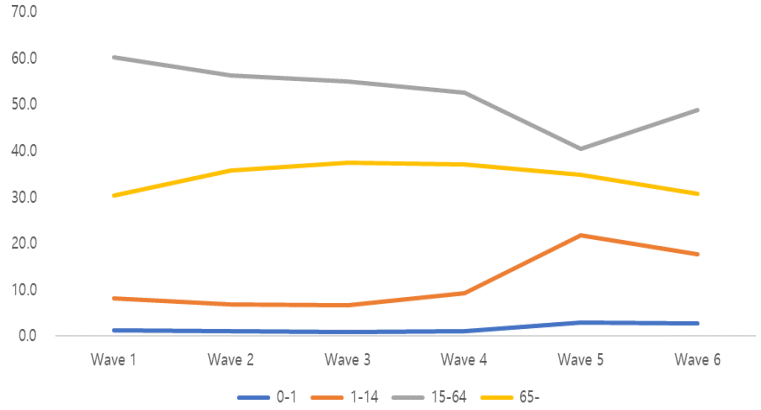

Figure 2 Age Distribution of COVID-19 Patients Acress Pandemic Waves