Abstract

Number of Cabapenem-resistant *Enterobacteriaceae* infections in Republic of Korea (2018-2020)

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Carbapenem-resistant *Enterobacteriaceae* (CRE) infection is a national notifiable infectious disease caused by Enterobacteriaceae that is resistant to carbapenem antimicrobials. Domestic CRE infection was designated as a national notifiable infectious disease in December 2010 and is monitored within a sentinel surveillance system. On June 3, 2017, it became a mandatory surveillance system and was designated as a class 2 infectious disease that is monitored by all medical institutions. This report analyzed the status of domestic outbreaks by year, isolate, medical institution, age, and carbapenemase. This report targeted 45,436 reported cases of total surveillance reported through the Korea Disease Control and Prevention Agency's (KDCA) surveillance system from 2018 to 2020. There were 11,954 CRE infection cases (723 medical institutions) in 2018, 15,369 cases (831 medical institutions) in 2019, and 18,113 cases (938 medical institutions) in 2020. Out of the isolates, *klebsiella pneumoniae* isolates were the most common and, out of the genotypes, KPC were the most common. When classifying medical institutions by type, among all reports, the reporting rate at nursing hospitals increased annually to 4.3% (517 cases) in 2018, 7.0% (1,077 cases) in 2019, and 8.2% (1,485 cases) in 2020. By age, individuals aged 70 and over accounted for the largest proportion. The proportion of carbapenemase-producing *Enterobacteriaceae* (CPE) in CRE increased to 49.9% (5,962 cases) in 2018, 57.8% (88,887 cases) in 2019, and 61.9% (11,218 cases) in 2020.

The increasing trend of CRE infection was estimated to be due to various factors, such as an increase in reporting institutions after the transition to a mandatory surveillance system, an increase in the actual occurrence of CRE infection, and an increase in screening tests for high-risk groups at medical institutions. This report recommended that a long-term plan of prevention and management of healthcare associated CRE infection (2018-2022) be promoted to reduce the incidence of CRE infection. In addition, active management is required to prevent the spread of CRE infection in medical institutions.

Keywords: Carbapenem-resistant *Enterobacteriaceae,* Carbapenemase-producing *Enterobacteriaceae*

Table 1. Carbapenem-resistant *Enterobacteriaceae* (CRE) species (2018-2020)

	2018 (n=12,013)	2019 (n=15,640)	2020 (n=19,659)
K. pneumoniae	6,289 (52.4)	9,452 (60.4)	12,296 (62.5)
E. coli	1,805 (15.0)	3,010 (19.2)	3,541 (18.0)
Enterobacter	1,199 (10.0)	1,853 (11.8)	1,869 (9.5)
C. freundii	260 (2.2)	403 (2.6)	501 (2.5)
K. oxytoca	167 (1.4)	234 (1.5)	315 (1.6)
S. marcescens	66 (0.5)	136 (0.9)	278 (1.4)
C. koseri	41 (0.3)	118 (0.8)	113 (0.6)
R. ornithinolytica	14 (0.1)	30 (0.2)	49 (0.2)
P. rettgeri	76 (0.6)	118 (0.8)	137 (0.7)
K. pneumoniae except *Klebsiella* spp.	43 (0.4)	127 (0.8)	220 (1.1)
R. ornithinolytica except *Raoultella* spp.	21 (0.2)	12 (0.1)	15 (0.1)
C. freundii except *Ctrobacter* spp.	38 (0.3)	4 (0.0)	138 (0.7)
Proteus spp.	124 (1.0)	57 (0.4)	40 (0.2)
Morganella morganii	0 (0.0)	23 (0.1)	21 (0.1)
P. rettgeri except *Providencia* spp.	2 (0.0)	21 (0.1)	24 (0.1)
Etc.	5 (0.0)	42 (0.3)	78 (0.4)
Missing	1,863 (15.5)	0 (0.0)	24 (0.1)

Table 2. Distribution of Carbapenemase-producing *Enterobacteriaceae* (CRE) (2018-2020)

(Number, %)

Characteristic	2018	2019	2020
CRE	11,954 (100)	15,369 (100)	18,113 (100)
CPE	5,962 (49.9)	8,887 (57.8)	11,218 (61.9)

Table 3. Distribution of Carbapenemase genotypes by *Enterobacteriaceae* (2018-2020)

(Number, %)

Characteristic	2018	2019	2020
KPC[1)]	4,132 (71.2)	6,309 (68.5)	8,958 (73.8)
NDM[2)]	1,432 (24.7)	2,240 (24.3)	2,516 (20.7)
OXA-48[3)]	116 (2.0)	533 (5.8)	522 (4.3)
VIM[4)]	69 (1.2)	59 (0.6)	60 (0.5)
IMP[5)]	43 (0.7)	53 (0.6)	67 (0.6)
GES[6)]	8 (0.1)	15 (0.2)	13 (0.1)

1) *Klebsiella pneumoniae* carbapenemases
2) New Delhi metallo-β-lactamase
3) Oxacillinase-48
4) Verona integron-encoded metallo-β-lactamase
5) Imipenemase
6) Guiana extended spectrum β-lactamase

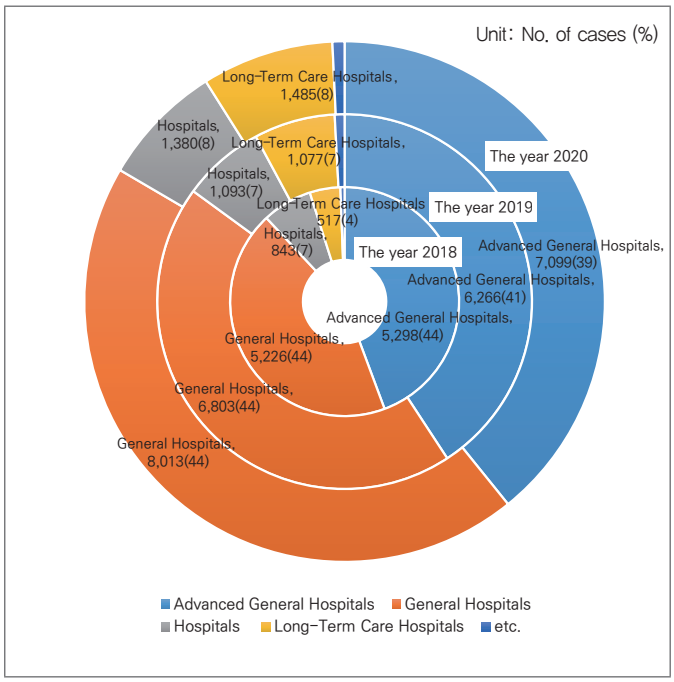

Figure 1. Carbapenem-resistant *Enterobacteriaceae* (CRE) by Type of Hospitals

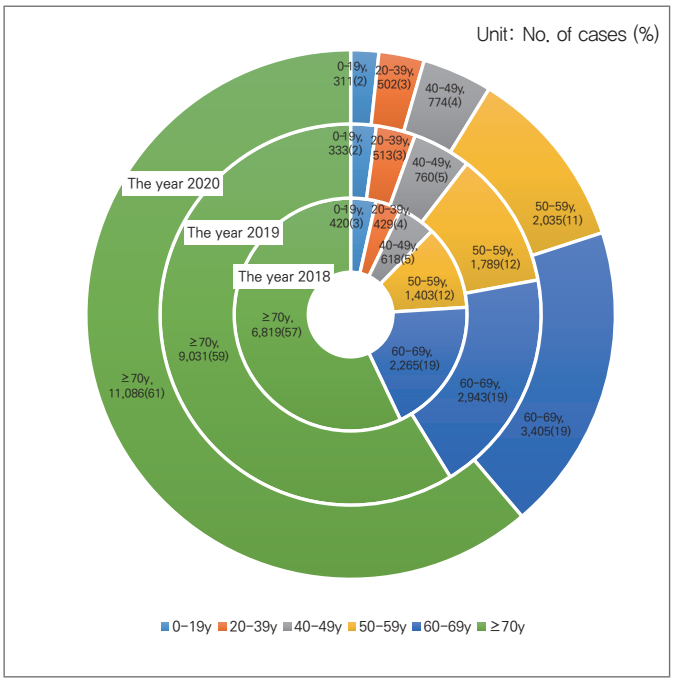

Figure 2. Carbapenem-resistant *Enterobacteriaceae* (CRE) by Age