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The incidence of *C. striatum* hospital-acquired pneumonia sharply increased and was associated with a high mortality rate

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Background

- The clinical information on patients with severe *Corynebacterium striatum* p neumonia who require intensive care unit admission is currently limited.

Methods

- We investigated the incidence and characteristics of severe *C. striatum* pneu monia during a 6-year period at Asan Medical Center in comparison with sev ere pneumonia associated with methicillin-resistant *Staphylococcus aureus* (MRSA).

Results

- Between 2014 and 2019, there were 27 adult cases of severe *C. striatum* pne umonia. The majority of the cases (70.4%) were hospital-acquired pneumoni a (HAP), and about half of the patients (51.9%) were immunocompromised.
- The incidence of *C. striatum* HAP significantly increased from 1.0% (2/200) in 2014-2015 to 5.4% (10/185) in 2018-2019 ($P < 0.001$), while the incidence of MRSA HAP significantly decreased from 12.0% to 2.7% during the same perio d. Of the 75 HAP cases whose bacterial pathogens were identified in 2018–2 019, *C. striatum* was responsible for 13.3% of the cases.
- The 90-day mortality rates were similarly high in the *C. striatum* and MRSA gr oups (59.3% vs. 50.5%, $P = 0.42$).

Conclusion

- In conclusion, *C. striatum* was a major pathogen of recent severe HAP and w as associated with a substantially high mortality rate.

Results

Table 1. Characteristics of adult patients with severe pneumonia caused by *Corynebacterium striatum*, Seoul, South Korea, 2014–2019

	Total (n = 130)	*C. striatum* (n = 27)	MRSA (n = 103)	p
Male sex	92 (70.8)	18 (66.7)	74 (71.8)	0.60
Age, median (interquartile range)	71.0 (63.8–77.0)	72.0 (66.0–80.0)	71.0 (63.0–76.0)	0.17
Underlying disease or condition*				
Solid cancer	32 (24.6)	4 (14.8)	28 (27.2)	0.18
Diabetes mellitus	30 (23.1)	6 (22.2)	24 (23.3)	0.91
Structural lung disease	24 (18.5)	4 (14.8)	20 (19.4)	0.78
Chronic obstructive lung disease	12 (9.2)	3 (11.1)	9 (8.7)	0.71
Interstitial lung disease	5 (3.8)	0	5 (4.9)	0.58
Bronchiectasis	4 (3.1)	0	4 (3.9)	0.58
Destroyed lung due to tuberculosis	1 (0.8)	0	1 (1.0)	1.00
Pneumoconiosis	1 (0.8)	0	1 (1.0)	1.00
Bronchiolitis obliterans	1 (0.8)	1 (3.7)	0	0.21
Hematologic malignancy	13 (10.0)	5 (18.5)	8 (7.8)	0.14
Liver cirrhosis	11 (8.5)	2 (7.4)	9 (8.7)	1.00
End-stage renal disease	7 (5.4)	2 (7.4)	5 (4.9)	0.64
Chronic renal failure	6 (4.6)	3 (11.1)	3 (2.9)	0.10
Congestive heart failure	3 (2.3)	1 (3.7)	2 (1.9)	0.51
Alcoholism	2 (1.5)	0	2 (1.9)	1.00
Cerebrovascular attack	12 (9.2)	5 (18.5)	7 (6.8)	0.13
Solid organ transplantation	2 (1.5)	0	2 (1.9)	0.63
Hematopoietic stem cell transplantation	3 (2.3)	2 (7.4)	1 (1.0)	0.11
Immunocompromised state†	41 (31.5)	14 (51.9)	27 (26.2)	0.01
Recent chemotherapy	23 (17.7)	7 (25.9)	16 (15.5)	0.26
Recent surgery (within 1 month)	19 (14.6)	2 (7.4)	17 (16.5)	0.36
Active smoker	10 (7.7)	1 (3.7)	9 (8.7)	0.69
Neutropenia‡	8 (6.2)	4 (14.8)	4 (3.9)	0.06
Category of pneumonia				
Community-acquired pneumonia	6 (4.6)	1 (3.7)	5 (4.9)	1.00
Healthcare-associated pneumonia	37 (28.5)	4 (14.8)	33 (32.0)	0.08
Hospital-acquired pneumonia	63 (48.5)	19 (70.4)	44 (42.7)	0.01
Ventilator-associated pneumonia	24 (18.5)	3 (11.1)	21 (20.4)	0.40

Data are presented as number (%) unless stated otherwise. MRSA, methicillin-resistant *Staphylococcus aureus*.
*Some patients had one or more underlying diseases or conditions.
†Defined as one of the following conditions: (i) daily receipt of immunosuppressants, including corticosteroids, (ii) human immunodeficiency virus infection, (iii) solid organ or hematopoietic stem cell transplant recipients, (iv) receipt of chemotherapy for underlying malignancy during the previous 6 months, and (v) underlying immune deficiency disorder. ‡Absolute neutrophil count < 500/mm^3.

Table 2. Bacterial pathogens detected among 565 patients with severe hospital-acquired pneumonia, Seoul, South Korea, 2014–2019

Pathogen identified	2014–2015 (n = 200)	2016–2017 (n = 180)	2018–2019 (n = 185)	Total (N = 565)	p†
Total	88 (44.0)	66 (36.7)	75 (40.5)	229 (40.5)	0.35
Staphylococcus aureus	27 (13.5)	15 (8.3)	8 (4.3)	50 (8.8)	< 0.01
Methicillin-susceptible	3 (1.5)	0	3 (1.6)	6 (1.1)	0.24
Methicillin-resistant	24 (12.0)	15 (8.3)	5 (2.7)	44 (7.8)	< 0.01
Corynebacterium striatum	2 (1.0)	7 (3.9)	10 (5.4)	19 (3.4)	0.05
Streptococcus pneumoniae	4 (2.0)	2 (1.1)	1 (0.5)	7 (1.2)	0.43
Legionella pneumophila	1 (0.5)	1 (0.6)	0	2 (0.4)	0.61
Moraxella catarrhalis	0	0	1 (0.5)	1 (0.2)	0.36
Streptococcus pyogenes	0	1 (0.6)	0	1 (0.2)	0.34
Nocardia species	0	0	1 (0.5)	1 (0.2)	0.36
Enteric Gram-negative bacilli	18 (9.0)	22 (12.2)	20 (10.8)	60 (10.6)	0.59
Klebsiella pneumoniae	13 (6.5)	14 (7.8)	16 (8.6)	43 (7.6)	0.73
Escherichia coli	4 (2.0)	4 (2.2)	3 (1.6)	11 (1.9)	0.92
Enterobacter cloacae	1 (0.5)	3 (1.7)	2 (1.1)	6 (1.1)	0.54
Citrobacter freundii	1 (0.5)	2 (1.1)	0	3 (0.5)	0.34
Klebsiella oxytoca	0	0	2 (1.1)	2 (0.4)	0.13
Hafnia alvei	0	0	1 (0.5)	1 (0.2)	0.36
Non-enteric Gram-negative bacilli	47 (23.5)	22 (12.2)	37 (20.0)	106 (18.8)	0.02
Acinetobacter baumannii	24 (12.0)	13 (7.2)	23 (12.4)	60 (10.6)	0.20
Pseudomonas aeruginosa	19 (9.5)	6 (3.3)	11 (5.9)	36 (6.4)	0.047
Stenotrophomonas maltophilia	4 (2.0)	2 (1.1)	7 (3.8)	13 (2.3)	0.22
Burkholderia cepacia	0	0	1 (0.5)	1 (0.2)	0.36
Acinetobacter lwoffii	0	1 (0.6)	0	1 (0.2)	0.34
Chryseobacterium indologenes	0	1 (0.6)	0	1 (0.2)	0.34
Chryseobacterium meningosepticum	1 (0.5)	0	0	1 (0.2)	0.40
Chlamydia pneumoniae	1 (0.5)	0	0	1 (0.2)	0.40

Data are presented as the number (%) of patients.
†Chi-squared test for trend.

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Table 3. Clinical and laboratory characteristics of patients with severe *Corynebacterium striatum* pneumonia and methicillin-resistant *Staphylococcus aureus* pneumonia, Seoul, South Korea, 2014–2019

	Total (n=130)	*C. striatum* (n=27)	MRSA (n=103)	p
Clinical manifestation				
Dyspnea	106 (81.5)	25 (92.6)	81 (78.6)	0.16
Fever > 38°C	103 (79.2)	18 (66.7)	85 (82.5)	0.07
Sputum	92 (70.8)	16 (59.3)	76 (73.8)	0.14
Cough	57 (43.8)	11 (40.7)	46 (44.7)	0.72
Altered mental status	46 (35.4)	10 (37.0)	36 (35.0)	0.84
Diarrhea	4 (3.1)	2 (7.4)	2 (1.9)	0.19
Septic shock at ICU admission	81 (62.3)	12 (44.4)	69 (67.0)	0.03
Mechanical ventilation	127 (97.7)	27 (100)	100 (97.1)	1.00
APACHE II score (mean ± SD)	25.6 ± 8.1	26.4 ± 11.9	26.0 ± 7.0	0.72
SOFA score (mean ± SD)	9.5 ± 3.7	9.5 ± 3.4	9.5 ± 3.7	0.99
Bacteremia	19 (14.6)	1 (3.7)	18 (17.5)	0.12
Laboratory findings (median, IQR)				
White blood cells/mm^3	10,950 (7,800–15,625)	11,600 (4,800–15,900)	10,700 (8,400–15,600)	0.26
Platelets, 10^3/mm^3	159 (81–242)	123 (55–230)	171 (102–245)	0.14
C-reactive protein, mg/dl	11.3 (5.5–19.3)	13.6 (8.0–19.8)	10.8 (5.4–18.6)	0.61
Procalcitonin, ng/ml	1.1 (0.3–3.9)	0.3 (0.1–1.3)	1.8 (0.4–4.2)	< 0.01

Data are presented as the number (%) of patients unless stated otherwise.
APACHE, acute physiology and chronic health evaluation; BAL, bronchoalveolar lavage; ICU, intensive care unit; IQR, interquartile range; MRSA, methicillin-resistant *Staphylococcus aureus*; SD, standard deviation; SOFA, sequential organ failure assessment; WBC, white blood cell count.

Table 4. of patients with severe *Corynebacterium striatum* pneumonia and methicillin-resistant *Staphylococcus aureus* pneumonia, Seoul, South Korea, 2014–2019

Outcome	Total (n=130)	*C. striatum* (n=27)	MRSA (n=103)	p
Mortality				
30-day mortality	41 (31.5)	11 (40.7)	30 (29.1)	0.25
60-day mortality	57 (43.8)	14 (48.1)	44 (42.7)	0.61
90-day mortality	68 (52.3)	16 (59.3)	52 (50.5)	0.42
In-hospital mortality	73 (56.2)	19 (70.4)	54 (52.4)	0.09
ICU stay, days (median, IQR)	14.0 (8.0–26.3)	14.0 (9.0–27.0)	14.0 (8.0–26.0)	0.33
Hospital-stay after ICU admission (median, IQR)	29.5 (14.0–57.0)	30.0 (16.0–81.0)	29.0 (14.0–55.0)	0.48

Data are presented as the number (%) of patients unless indicated otherwise.
ICU, intensive care unit; IQR, interquartile range; MRSA, methicillin-resistant *Staphylococcus aureus*.