

Clearance of carbapenemase-producing Enterobacteriaceae (CPE) carriage: NDM-1 versus KPC CPE

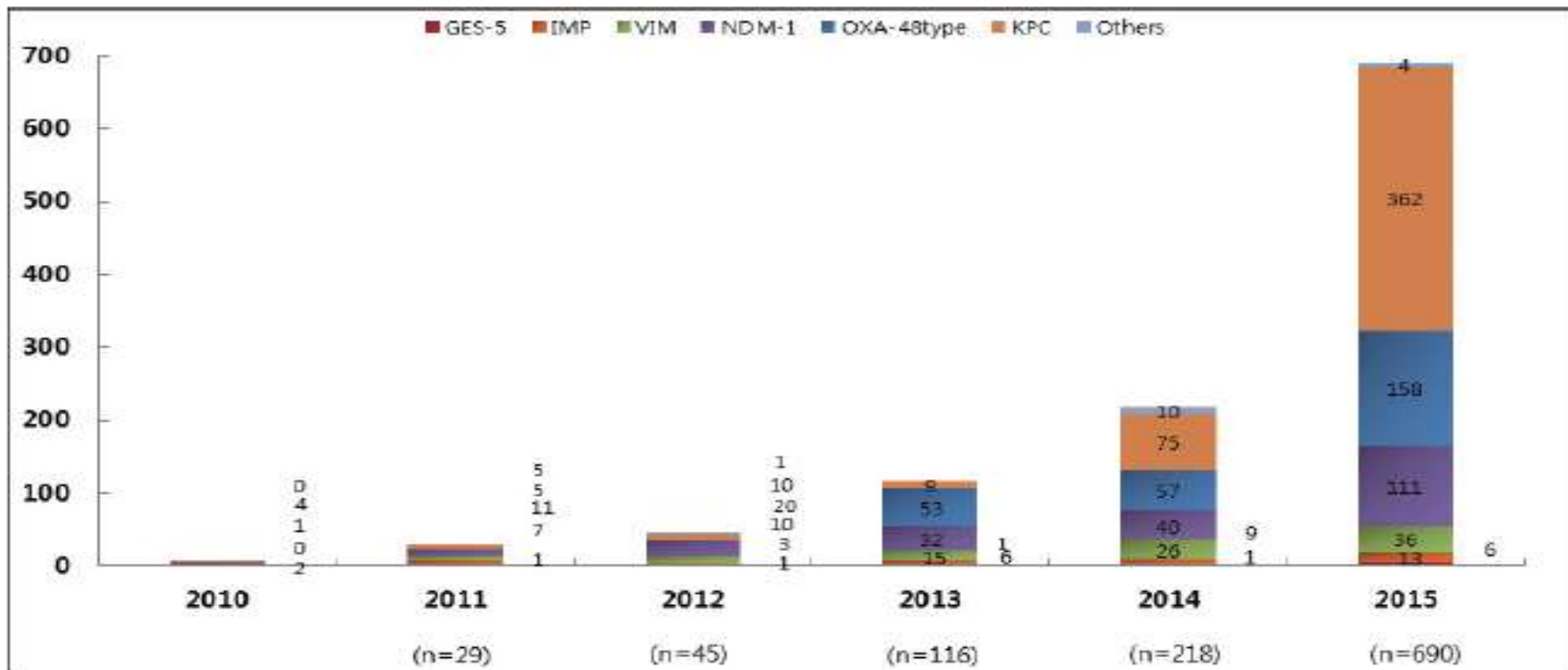
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Background

- The global spread of carbapenemase-producing *Enterobacteriaceae* (CPE) has become a serious public health concern
- Understanding the characteristics of CPE carriage and transmission in healthcare settings

Distribution of genes isolated from CPE in Korea



Resource : Korean antimicrobial resistance monitoring system
2015 annual report

Methods

- **Setting**

- From November 2010 to October 2016
- Asan medical center (AMC),
tertiary care hospital in Seoul, Korea
- 2,700 beds



Methods

- **Microbiologic evaluation**

- Phenotypic assays and in-house polymerase chain reaction (PCR) assays for *bla*_{KPC}, *bla*_{NDM}, *bla*_{VIM}, *bla*_{IMP}, and *bla*_{OXA-48}
- Surveillance culture
 - MacConkey agar plate supplemented with imipenem (1 µg/mL)
 - Microscan system (Dade Behring, Deerfield, IL)

CPE control protocol(1)

- Single room isolation with strict contact precautions
- Sodium hypochlorite disinfection of environment
- Hydrogen peroxide vapor room decontamination after discharge

CPE control protocol(2)

- Surveillance cultures for patients who shared a room with CPE-positive patients
- Weekly follow up surveillance cultures
- Surveillance culture specimen
 - Stool or rectal swab
 - Urine
 - draining fluid (if patient had any drainage catheter)

Term definition

- CPE clearance
 - ≥ 3 consecutive CPE-negative cultures from all specimen test every week

Result

Variable	NDM-1 (N=106)	KPC (N=41)	P value	Total (N=147)
Male sex	74 (69.8)	28 (68.3)	0.86	102 (69.4)
Age, median (IQR), years	62.0 (52.0-71.0)	67.0 (56.5-75.0)	0.08	63.0 (53.0-72.0)
Underlying illness or condition				
Solid cancer	38 (35.8)	10 (24.4)	0.18	48 (32.7)
Solid organ transplant	31 (29.2)	11 (26.8)	0.77	42 (28.6)
Diabetes mellitus	19 (17.9)	14 (34.1)	0.04	33 (22.4)
Liver cirrhosis	18 (17.0)	5 (12.2)	0.47	23 (15.6)
End-stage renal disease	14 (13.2)	3 (7.3)	0.40	17 (11.6)
Recent surgery (within 60 days)	57 (53.8)	11 (26.8)	0.003	68 (46.3)

IQR=Interquartile range

Result

Variable	NDM-1 (N=106)	KPC (N=41)	P value	Total (N=147)
Organism				
<i>Klebsiella pneumoniae</i>	38 (35.8)	39 (95.1)		77 (52.4)
<i>Enterobacter cloacae</i>	32 (30.2)	0		32 (21.8)
<i>Citrobacter freundii</i>	10 (9.4)	0		10 (6.8)
<i>Escherichia coli</i>	9 (8.5)	1 (2.4)		10 (6.8)
<i>Klebsiella oxytoca</i>	9 (8.5)	1 (2.4)		10 (6.8)
<i>Serratia marcescens</i>	7 (6.6)	0		7 (4.8)
<i>Morganella morganii</i>	1 (0.9)	0		1 (0.7)

Result

Variable	NDM-1 (N=106)	KPC (N=41)	P value	Total (N=147)
Initial CPE-positive specimen				
urine	28 (26.4)	10 (24.4)	0.80	38 (25.9)
blood	20 (18.9)	5 (12.2)	0.33	25 (17.0)
stool	16 (15.1)	9 (22.0)	0.32	25 (17.0)
sputum	9 (8.5)	12 (29.3)	0.001	21 (14.3)
bile	6 (5.7)	4 (9.8)	0.47	10 (6.8)

Result

Variable	NDM-1 (N=106)	KPC (N=41)	P value	Total (N=147)
Hospital stay before CPE identification, median (IQR), days	55.0 (30.5-125.0)	43.0 (27.5-98.0)	0.41	53.5 (29.0-112.5)
Prior receipt of carbapenem therapy	48 (45.3)	15 (36.6)	0.34	63 (42.9)
Number of f/u surveillance culture, median (IQR)	3.0 (2.0-5.5)	3.0 (2.0-7.8)	0.38	3.0 (2.0-6.0)
Three, consecutive negative cultures	16 (15.1)	0	0.006	16 (10.9)
CPE clearance at hospital discharge	12 (11.3)	0	0.02	12 (8.2)
In-hospital mortality	26 (24.5)	13 (31.7)	0.38	39 (26.5)

Result

Variable	No. of clearance/no. of episodes(%)		P value
	No	Yes	
Solid cancer	10/99 (10.1)	2/48 (4.2)	0.34
Solid organ transplant	8/105 (7.6)	4/42 (9.5)	0.74
Diabetes mellitus	9/114 (7.9)	3/33 (9.1)	0.73
Liver cirrhosis	11/124 (8.9)	1/23 (4.3)	0.69
Immunosuppressant usage	7/112 (6.3)	5/35 (14.3)	0.16
Immunocompromised state	4/61 (6.6)	6/59 (10.2)	0.53

Result

Variable	No. of clearance/no. of episodes(%)		P value
	No	Yes	
Recent surgery	6/79 (7.6)	6/68 (8.8)	0.79
Organism	8/70 (11.4)	4/77 (5.2)	0.23
Bacteremia	10/122 (8.2)	2/25 (8.0)	1.00
Stool CPE-positive	6/61 (9.8)	6/86 (7.0)	0.56
Antibiotic usage after CPE identification	1/14 (7.1)	11/133 (8.3)	1.00
Carbapenem usage after CPE identification	7/79 (8.9)	5/68 (7.4)	0.74
Proton pump inhibitor usage	12/139 (8.6)	0/8	1.00

Conclusion

- KPC CPE was associated with higher rate of persistent colonization at the time of hospitalization
- Further investigations are required to identify the factor associated non clearance.

Thank you for your attention

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