

Factors Associated With Carbapenem-Resistant Gram-Negative Bacteremia In Febrile Neutropenic Patients In Ratchaburi Hospital, Thailand



Wutthiseth Dhitinanmuang^{1*}, Nanthakorn Janphang², Pakwan Chomsaiplaingam², Pheeranat Saengchatree², Munthanaporn Samanmit², Suchanan Phomchanah²
Division of Infectious Disease, Department of Medicine, Ratchaburi Hospital, Thailand¹
Medical Education Center, Ratchaburi Hospital, Praboromarajchanok institute, Thailand²
*Correspondence: wutthiseth.dhi@pi.ac.th

Introduction

Acinetobacter baumannii, *Pseudomonas aeruginosa*, and Enterobacterales often cause hospital-acquired infections, particularly in febrile neutropenic patients. The increasing prevalence of drug resistance limits treatment options and is associated with higher mortality rate. Therefore, factors associated with carbapenem-resistant bacteremia in neutropenic patients are particularly concern .

Objective

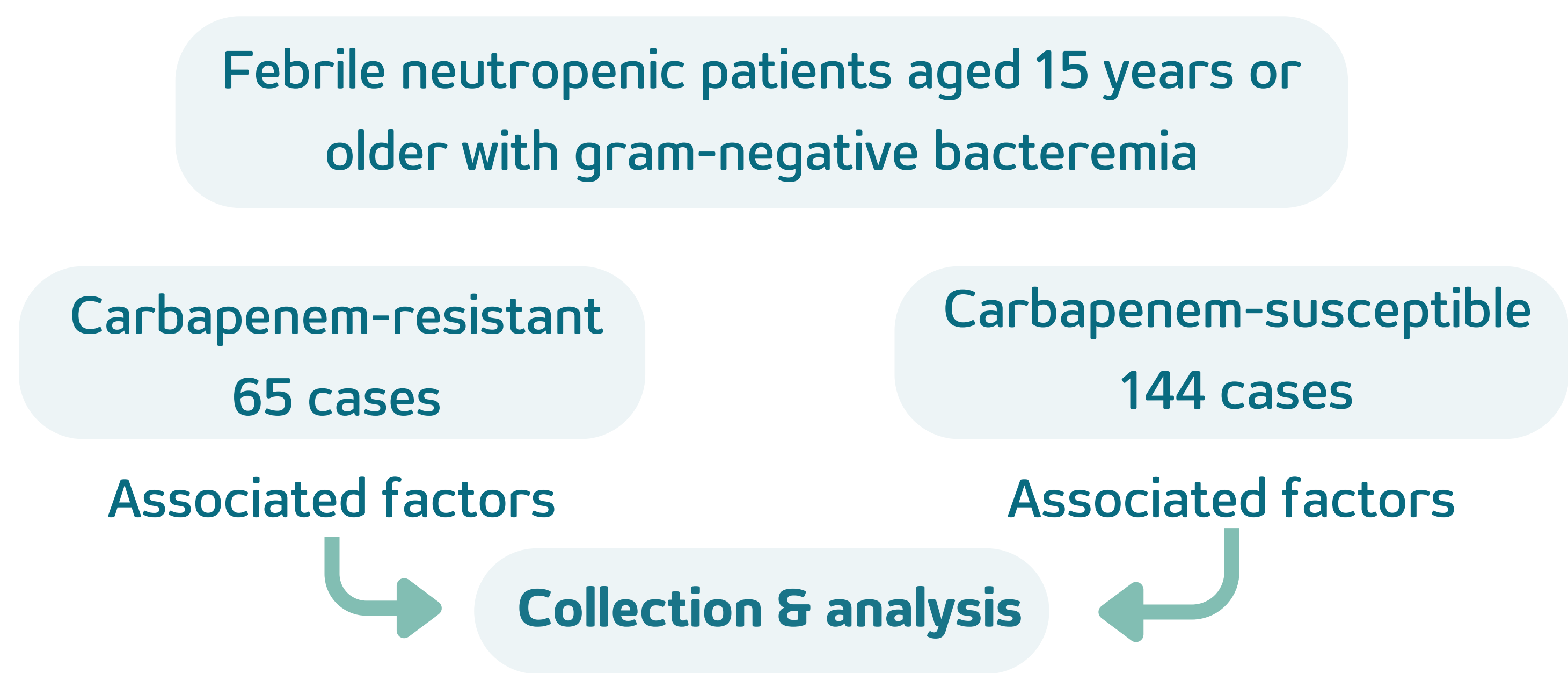
- Primary outcome**

To evaluate factors associated with carbapenem-resistant gram negative bacteremia in febrile neutropenic patients in Ratchaburi Hospital
- Secondary outcome**

To evaluate mortality rate and length of stay after bacteremia

Methodology

A single center, retrospective case control study was conducted in Ratchaburi Hospital, between Jan 2020 to Dec 2024.



Conclusions

- There are multiple associated factors including neutropenia day more than 5 days, day of admission before bacteremia more than 7 days, invasive procedures, any antibiotic received, meropenem received, piperacillin-tazobactam received, other antibiotics received, receiving one type of antibiotics, receiving two or more types of antibiotics, albumin < 3 g/dL.
- Patients with carbapenem-resistant bacteremia had significantly higher mortality rate.

Limitations

- This study was a retrospective descriptive study; therefore, some data may have been incompletely recorded in the electronic medical records.
- This study included only patients admitted to Ratchaburi Hospital. Consequently, the identified risk factors and incidence of antimicrobial resistance reflect the specific local context. Therefore, the findings may have limited generalizability and may not be directly applicable to settings with substantially different epidermiological contexts.

Recommendations

- Adopt a prospective study design to ensure more comprehensive and accurate risk factor data collection
- Investigate mortality-associated factors in patients with antimicrobial - resistant infections

Results

Table 1 Demographic data of carbapenem-resistant and carbapenem-susceptible gram-negative bacteremia in febrile neutropenic patients in Ratchaburi Hospital

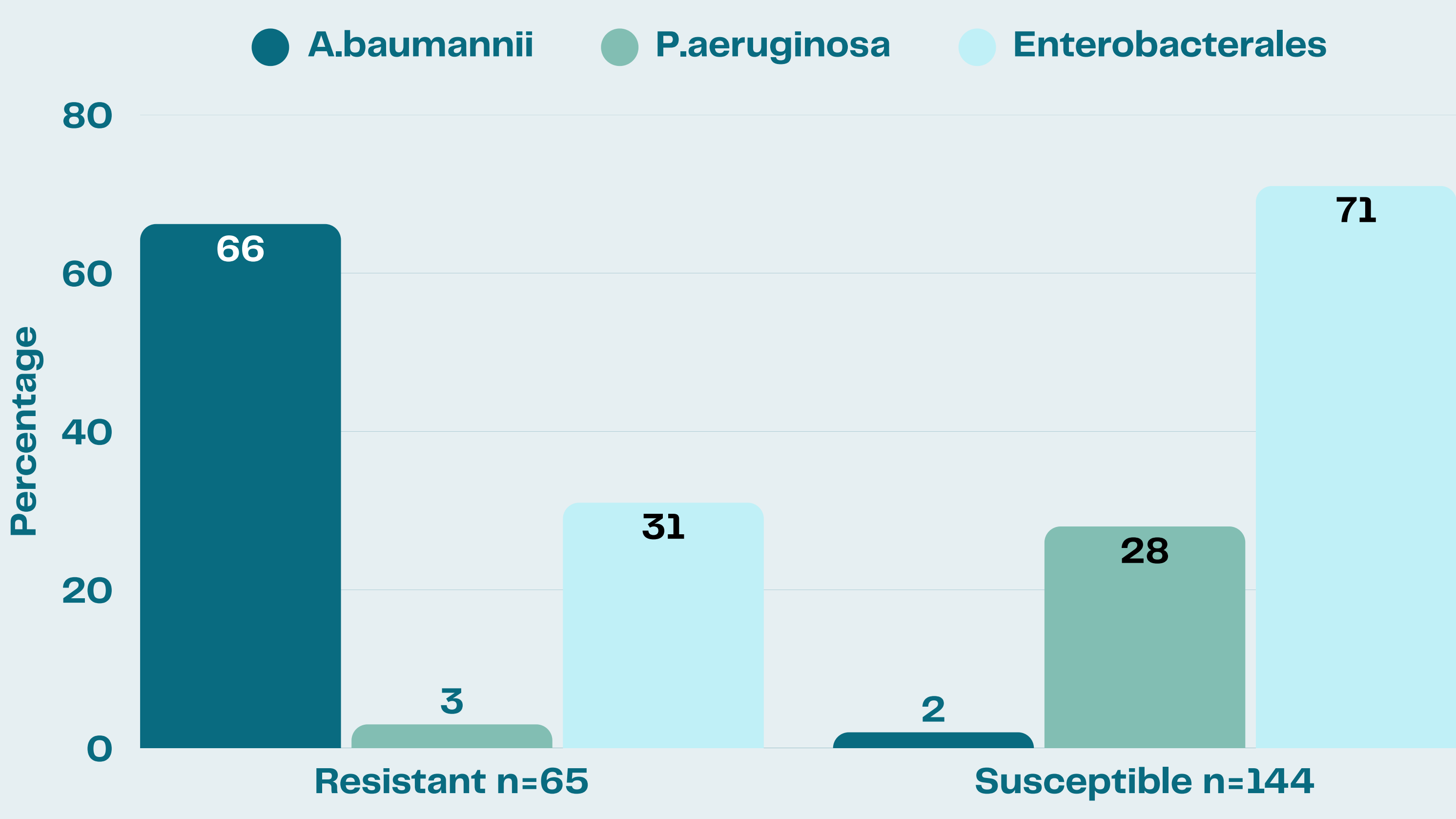


Table 2 Multivariate binary logistic regression model for factors associated with carbapenem-resistant gram-negative bacteremia in febrile neutropenic patients in Ratchaburi Hospital

Parameters	Adjusted OR	95% CI	p-value
Male sex	0.669	0.31-1.442	0.305
Neutropenia days more than 5 days	2.747	1.229-6.141	0.014
Day of admission before bacteremia more than 7 days	2.837	1.212-6.644	0.016
Invasive procedures	5.725	2.104-15.579	0.001
Any antibiotic received	16.583	1.997-137.729	0.009
Albumin < 3 g/dl	2.195	1.006-4.79	0.048
Exposure to ATB agents (last 3 months)			
MODEL A: Any antibiotic received	16.583	1.997-137.729	0.009
MODEL B: meropenem	2.227	1.066-4.655	0.033
MODEL C: piperacillin-tazobactam	2.715	1.225-6.014	0.014
MODEL D : Others ATB	2.238	1.069-4.687	0.033
MODEL E: Number of antibiotics recieved			0.022
0	Ref	0.06-0.450	0.007
1	10.817	1.144-102.287	0.038
≥ 2	18.544	2.222-154.783	0.007

For exposure to ATB agents last 3 months was analyzed using five models: MODEL A: Any antibiotic received, MODEL B: meropenem, MODEL C: piperacillin-tazobactam, MODEL D : Others ATB, MODEL E: Number of antibiotics recieved , Ref=0.054

Table 3 Secondary outcomes including death and length ofstay compared between carbapenem-resistant and carbapenem-susceptible gram-negative bacteremia in febrile neutropenic patients in Ratchaburi Hospital

	Resistant (n=65)	Susceptible (n=144)	p-value
Outcome			
Death, n (%)	48 (73.8)	46 (31.9)	<0.001
Alive patients			
Length of stay, days median(IQR) (n=115)	19 (11.5-24)	13 (9-18.5)	0.135

- Incorporate validated clinical severity indices (e.g., APACHE II, MASCC)
- Conduct multicenter or regional studies to increase statistical power for pathogen-specific analyses

References

1.Auesomwang C, Suwannawiboon B, Chayakulkeeree M. Changes in etiologic microorganisms in Thai patients with chemotherapy-induced neutropenia and fever. J Med Assoc Thai 2018;101:173-80.

2.Salvador Pérez-Galera, Jose M. Bravo-Ferrer, María Paniagua, Tomislav Kostyanev, Marlieke E. A. de Kraker, Jan Feifel, et al. Risk factors for infections caused by carbapenem-resistant Enterobacterales: an international matched case-control-control study (EURECA). Lancet. 2023;57:101871

3.Guh AY, Bulens SN, Mu Y, Jacob JT, Reno J, Scott J, et al. Epidemiology of Carbapenem-Resistant Enterobacteriaceae in 7 US communities, 2012-2013. JAMA 2015; 314: 1479-87.

4.Lesho, E. P., Clifford, R. J., Chukwuma, U., Kwak, Y. I., Maneval, M., Neumann, C., McGann, P. (2015). Carbapenem-resistant Enterobacteriaceae and the correlation between carbapenem and fluoroquinolone usage and resistance in the US military health system. Diagnostic microbiology and infectious disease. 81(2):119-125.

5.Falagas ME, Tansarli GS, Karageorgopoulos DE, Vardakas KZ. Deaths attributable to carbapenem-resistant Enterobacteriaceae infections: a systematic review of the literature. Emerg Infect Dis. 2014;20(7):1170-5.

6.Martin A, Fahrbach K, Zhao Q, Lodise T. Association between carbapenem resistance and mortality among adult patients with Gram-negative systemic infections: a systematic review and meta-analysis. Open Forum Infect Dis. 2018;5(10):ofy210.

7.Anunnatsiri S, Tonsawan P. Risk factors and clinical outcomes of multidrug-resistant Acinetobacter baumannii bacteremia at a university hospital in Thailand. Southeast Asian J Trop Med Public Health. 2011 May;42(3):693-703. PMID: 21706949.

8.Sharma K, Tak V, Nag VL, Bhatia PK, Kothari N. An observational study on carbapenem-resistant Enterobacterales (CRE) colonisation and subsequent risk of infection in an adult intensive care unit (ICU) at a tertiary care hospital in India. Infect Prev Pract. 2023;5(4):100312.