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Letter to the Editor

Clinical investigation for infections caused by Enterobacteriaceae in intensive care unit of Anhui, China

Dear Editor,

Enterobacteriaceae has emerged as the most common isolates of Gram-negative bacilli.[1] Antibiotic resistance surveillance programs have demonstrated an increase in resistance among these pathogens.[2] The problem of resistance is of particular concern in the intensive care unit (ICU) setting.

One hundred and nine ICU patients from whom *Escherichia coli*, *Klebsiella pneumoniae*, and *Enterobacter cloacae* were isolated between March 1, 2003 and December 30, 2009 were included. The mean age of the patients was 59.51 ± 18.33 years (range 7-102 years) and 86 (66.1%) patients were male. The mean length of stay in the hospital was 47.18 ± 59.44 days (range 1-426 days). Fever (range 37.6-41.0°C) occurred in 37 of 109 patients. White blood cell counts were 14.14 ± 8.50 ($\times 10^9$/L). The common underlying conditions were biliary disease (30.3%), cardiovascular disease (21.1%), lung disease (18.3%), and diabetes (10.1%). Of the total, 93 (85.3%) patients underwent surgical interventions.

The isolates obtained from different samples per patient were identified using the Microscan Walkaway-40 system (Dade Behring – USA) and the antimicrobial susceptibility tests were also performed with this system. Antimicrobial susceptibility was interpreted according to criteria of the Clinical and Laboratory Standards Institute (CLSI).[3] A total of 154 isolates including *E. coli* (66.2%), *K. pneumoniae* (20.8 %), and *E. cloacae* (13.0%) were available for investigation from 109 patients. The top-five samples were isolated from sputum (25.3%), pus (20.8%), bile (16.9%), peritoneal fluid (10.4%), and blood cultures (5.8%). The results of antimicrobial susceptibility test of different strains are listed in Table 1. Imipenem was consistently the most active antibiotic among those tested.

The overall multiresistance rate (a multiresistant strain was defined as in vitro resistance to at least three classes of cephalosporins, quinolones, aminoglycosides, and β-lactams) was 67.8% (74/109). Of 109 patients, 86.2% (94/109) received an empirical antibiotic therapy and 43.1% patients were treated with at the least two types of the four antibiotics listed above. Multiresistance was significantly associated with empirical antibiotic therapy with cephalosporins ($\chi^2 = 5.777$, $p = 0.016$) and quinolones ($\chi^2 = 4.089$, $p = 0.043$) in a multivariate analysis.

Table 1 - Antimicrobial resistance of *Escherichia coli*, *Klebsiella pneumoniae*, *Enterobacter cloacae*

Antibiotic	*E. coli* (n = 102)		*K. pneumoniae* (n = 32)		*E. cloacae* (n = 20)	
	n	R%	n	R%	n	R%
Imipenem	3	2.9	3	9.4	2	10
Ampicillin	34	33.3	15	46.9	20	100
SMZ-TMP	74	72.5	20	62.5	16	80
Cefepime	22	21.5	8	25	18	90
Ceftazidime	46	45.1	11	34.4	17	85
Cefatriaxone	63	61.8	16	50	18	90
Cefotaxime	50	49	12	37.5	18	90
Cefoxitin	13	12.7	11	34.4	18	90
Amikacin	22	21.6	11	34.4	12	60
Aztreonam	56	54.9	13	40.6	19	95
Gentamicin	61	59.8	17	53.1	12	60
Tobramycin	72	70.6	13	40.6	17	85
Ciprofloxacin	75	73.5	16	50.0	17	85
Ampicillin/sulbactam	85	83.3	18	56.3	20	100

Among 109 patients, 69 patients used mechanical ventilators, and 25 patients had a positive sputum culture and imaging. Only 21 patients fulfilled the definition of ventilator-associated pneumonia (VAP).[4] Diagnosis of pneumonia was significantly associated with the use of ventilators by univariate analysis ($\chi^2 = 5.982$, $p = 0.014$). 20.2% (23/109) of the investigated patients died. Firstly, we reported the risk factors associated with the mortality by univariate analysis. When these factors were further subjected to multivariate analysis, comorbidity ($\chi^2 = 5.609$, $p = 0.018$), catheterization, venous peripheral catheter, and ventral intubation ($\chi^2 = 6.829$, $p = 0.009$; $\chi^2 = 10.031$, $p = 0.002$; $\chi^2 = 7.968$, $p = 0.005$) were found to be significantly associated with mortality. However, no significant association was found between the use of ventilators and mortality.

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Conflict of interest

All the authors declare to have no conflict of interest.

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