

Epidemiology of Extended spectrum beta-lactamase (ESBL) producing Enterobacteriaceae as a cause of bacteraemia in Lao PDR



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Introduction

- Lao PDR is a landlocked country, surrounded by countries with a high prevalence of ESBL-producing Enterobacteriaceae, ranging from 45-55% [1]
- The first ESBL-producing *Escherichia coli* was identified in Mahosot hospital in 2004: from 2004-09, 9% of *E.coli* isolated from blood cultures were ESBL producers [2]
- The lack of diagnostic microbiology laboratories and absence of an effective AMR surveillance system in Lao PDR mean that few data are available and clinicians are unaware of the problem, leading to delays in selection of appropriate antibiotics.
- We retrospectively determined the proportion, clinical features, risk factors and antibiotic susceptibility pattern of ESBL-producing *E. coli* and *Klebsiella pneumoniae* causing bacteraemia at Mahosot hospital between 2010-14.



Mahosot Hospital, a 450 bed hospital in Vientiane, Lao PDR. Approximately 18,000 admissions/year.

Methodology

- Clinical and microbiological data were extracted from the database of an on-going study into the aetiology of fever at Mahosot hospital ('UI study'), laboratory records and hospital charts.
- Patients with blood cultures that grew *E.coli* and *K. pneumoniae* between 2010-14 were identified.
- Species identification was conducted by API 20E
- Antibiotic susceptibility testing was done by disk diffusion according to Clinical & Laboratory Standards Institute guidelines



Table 1: Characteristics of patients with ESBL-negative and ESBL-positive bacteraemia.

	Total (N=360) n/N (%)	ESBL-negative (N=288) n/N (%)	ESBL-positive (N=72) n/N (%)	P-value
Demographic data				
Age (Years), median (range)	57 (0-98)	58 (0-98)	53 (0.005-85)	0.03
≤ 15 year old	28/360 (8)	19/288 (7)	9/72 (12)	0.09
Male	144/360 (40)	109/288 (38)	35/72 (49)	0.09
Symptoms				
Days ill, median (IQR range)	3 (0-45)	3 (0-33)	3.5 (0-30)	0.7
Fever	345/356 (97)	277/286 (97)	68/70 (97)	1.00
Rigors	230/354 (65)	190/285 (67)	40/69 (58)	0.17
Headache	197/355 (55)	161/286 (56)	36/69 (52)	0.5
Arthralgia	119/355 (33)	96/286 (33)	23/69 (33)	0.9
Back pain	123/355 (35)	99/286 (35)	24/69 (35)	0.9
Myalgia	184/355 (52)	149/286 (52)	35/69 (51)	0.8
Retro-orbital pain	17/340 (5)	16/275 (6)	1/65 (2)	0.2
Jaundice	64/351 (18)	51/284 (18)	13/67 (19)	0.7
Nausea	121/352 (34)	101/284 (35)	20/68 (29)	0.3
Vomiting	98/352 (28)	81/284 (28)	17/68 (25)	0.5
Dysuria	61/352 (17)	48/284 (17)	13/68 (19)	0.66
Diarrhoea	67/351 (19)	59/283 (21)	8/68 (12)	0.08
Constipation	24/349 (7)	20/282 (7)	4/67 (6)	1.00
Abdominal pain	100/346 (29)	84/280 (30)	16/66 (24)	0.3
Sore throat	15/346 (4)	12/280 (4)	3/66 (5)	1.00
Drowsiness	56/346 (16)	43/280 (15)	13/66 (20)	0.38

Table 2: Univariate analysis for risk factors and outcomes of inpatients with ESBL-negative and ESBL-positive bacteraemia

	Total (N=360) n/N (%)	ESBL-negative (N=288) n/N (%)	ESBL-positive (N=72) n/N (%)	P-value
Underlying disease				
Diabetes	89/335 (26)	77/272 (28)	12/63 (19)	0.29
Excess alcohol	34/317 (11)	27/257 (11)	7/60 (12)	0.79
Smokes	37/311 (12)	28/253 (11)	9/58 (15)	0.34
Chronic renal failure	18/341 (5)	11/277 (4)	7/64 (11)	0.05
Renal stones	19/336 (6)	11/275 (4)	8/61 (13)	0.01
TB	6/236 (2)	5/194 (2)	1/42 (2)	0.92
HIV	5/294 (2)	5/242 (2)	0/52 (0)	0.72
Steroid use	14/303 (5)	11/251 (4)	3/52 (6)	0.78
Antibiotic last weeks	61/235 (26)	38/191 (20)	23/44 (52)	0.001
Outcome				
Lived	144/360 (40)	122/288 (42)	22/72 (30)	
Died in hospital	25/360 (7)	16/288 (5)	9/72 (12)	0.04
Discharged moribund	34/360 (9)	26/288 (9)	8/72 (11)	
Unknown	157/360 (43)	124/288 (43)	33/72 (45)	

Results

- 360 non-duplicate positive blood cultures that grew *E. coli* and *K. pneumoniae* were identified
- 72 (20%) produced ESBL (55 *E. coli* and 17 *K. pneumoniae*)
- The proportion of ESBL-producers increased steadily over time, especially *E. coli* (7.8% to 34.7%)

Figure 1: The trend of ESBL-producing *E.coli* and *K. pneumoniae* isolated from blood cultures between 2010-14 at Mahosot Hospital, Vientiane, Lao PDR

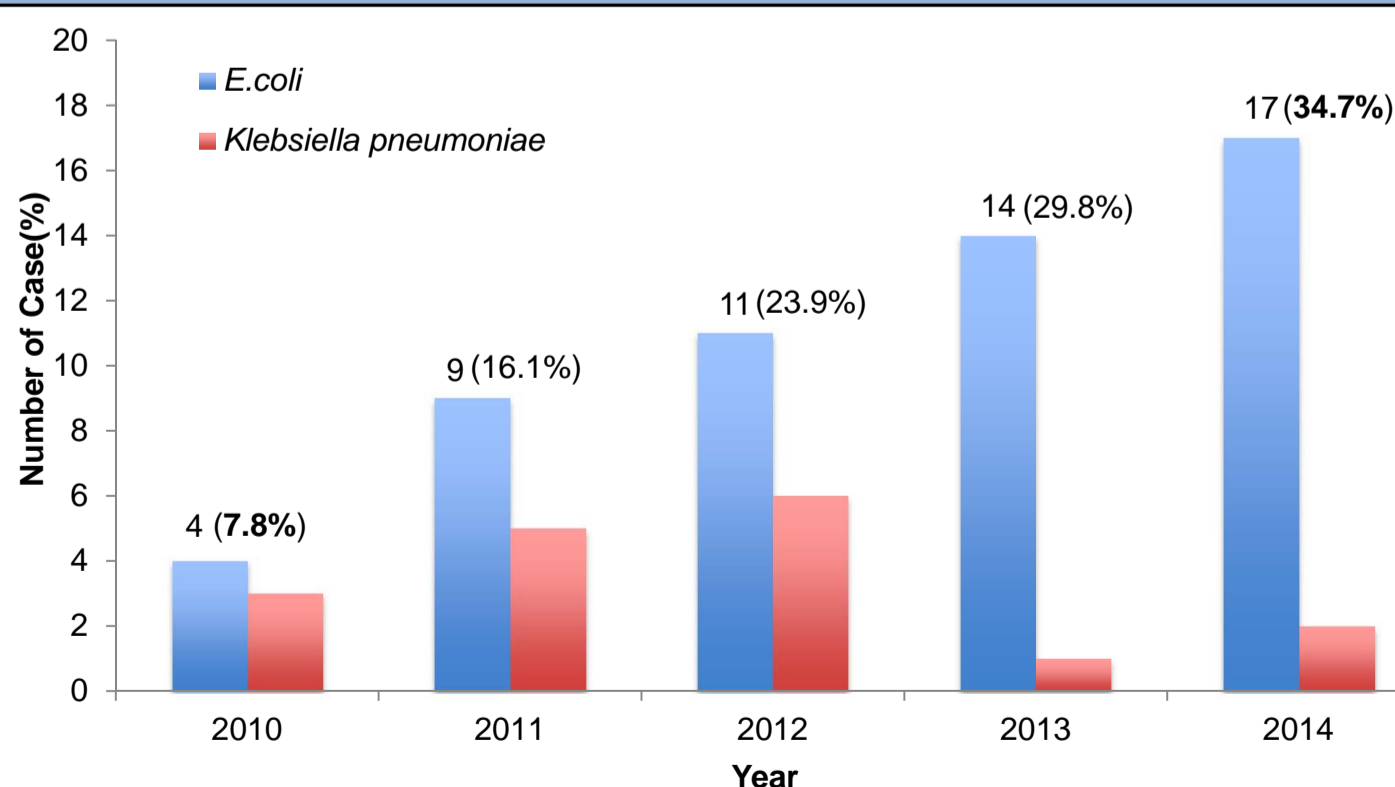
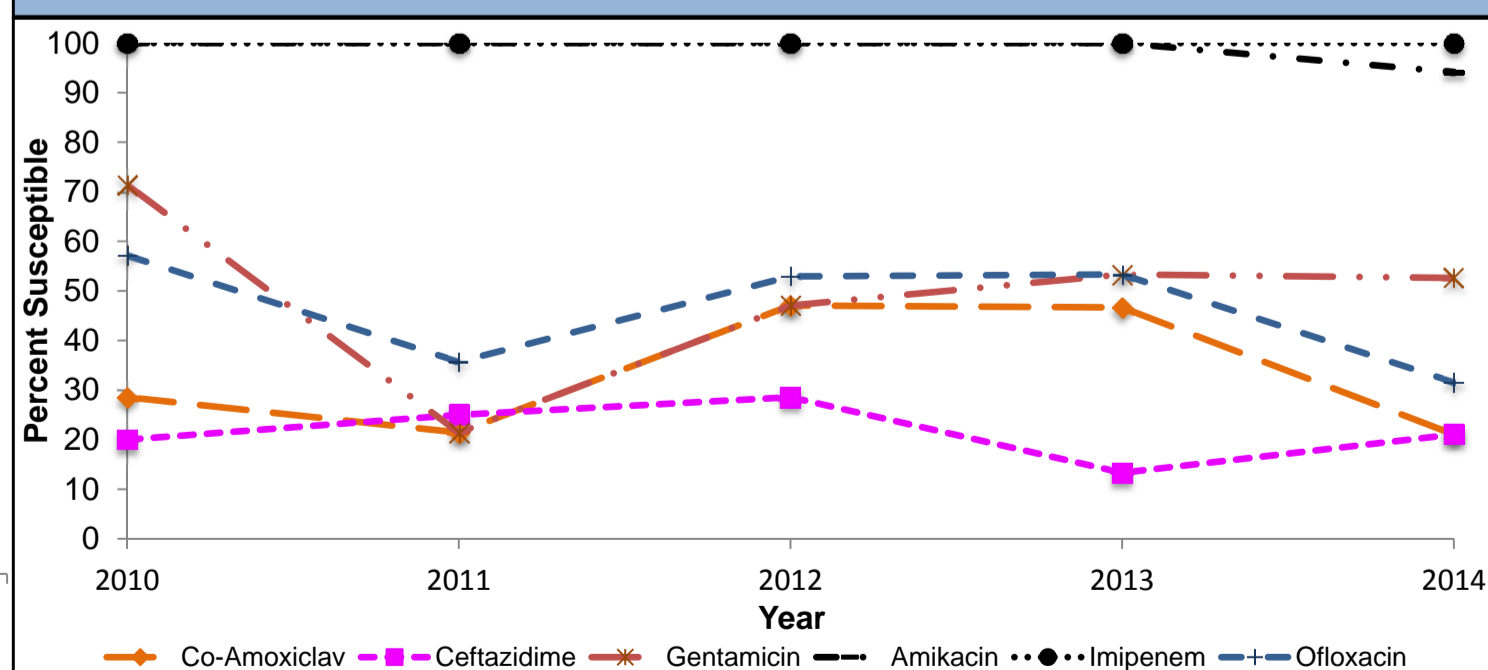


Figure 2: Susceptibility patterns of ESBL-producing *E.coli* and *K. pneumoniae* isolated from blood cultures between 2010-14 at Mahosot Hospital, Vientiane, Lao PDR.



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Conclusions

- ESBL-producing *E.coli* and *K. pneumoniae* have emerged as a real problem in Lao PDR, as in neighbouring countries [3]
- Co-morbidities such as renal stones, chronic kidney disease and previous use of antibiotics are associated with ESBL bacteremia
- Carbapenems and amikacin remain active against the majority of strains
- The retrospective nature of the study meant that there were limited data for analysis and interpretation
- This data emphasizes the need for urgent interventions to combat AMR in Lao PDR