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1. Background

- ESBL-producing Enterobacteriaceae (ESBL-E) are clinically problematic and drive the use of carbapenems, which can select for carbapenemase-producing Enterobacteriaceae.
- A range of enzymes lead to an 'ESBL' phenotype, most commonly CTX-M-type ESBLs.
- Risk factors associated with travel, especially to the Asian sub-continent, are typically associated with ESBL carriage.^{1,2}

2. Methods

- 4008 inpatients were tested for ESBL-E carriage in rectal swabs as part of universal admission screening project using chromogenic agar culture and semi-automated antimicrobial susceptibility testing (Vitek).
- Presumptive ESBL-E were confirmed by microarray (CheckPoint Check-MDR).
- Risk factor data was collected at the time of specimen collection and linked to demographic data.
- Univariable / multivariable binary logistic regression determined risk factors for ESBL-E.

Table 1: Factors associated with ESBL-E carriage

	ESBL-ve (n=3653)		ESBL+ve (n=355)		Sig.	OR	95% C.I. for OR	
	Count	%	Count	%			Lower	Upper
Ethnicity								
Asian / Asian British	99	2.7%	28	22.0%	.000	2.9	1.7	4.9
Not Stated	620	16.9%	63	9.2%	.017	1.5	1.1	2.1
Other	139	3.8%	22	13.7%	.037	1.8	1.0	3.1
Travel to Asia	189	5.2%	41	17.8%	.002	2.2	1.3	3.5
Travel to Africa	128	3.5%	26	16.9%	.011	2.1	1.2	3.7
Travel to Europe	791	21.7%	54	6.4%	.019	0.6	0.4	0.9
Overseas overnight hospital stay (past 12 months)	31	0.8%	10	24.4%	.004	5.6	1.7	17.8
2 or more antibiotic courses in the past 6 months	878	24.0%	134	13.2%	.000	2.2	1.6	3.0

Table 2: Breakdown of beta-lactamase gene and organism in ESBL-E

	<i>E.coli</i>		<i>K. pneumoniae</i>		Other		Total	
	Count	%	Count	%	Count	%	Count	%
ESBL	248	70.1	24	6.8	20	5.6	292	82.4
ESBL + AMPC	11	3.1	2	0.6	0	0.0	13	3.7
ESBL + CARBA	0	0.0	0	0.0	0	0.0	0	0.0
AMPC	8	2.3	2	0.6	1	0.2	11	3.0
CARBA	1	0.3	0	0.0	1	0.2	2	0.5
CARBA + AMPC	0	0.0	0	0.0	1	0.3	1	0.3
Negative	8	2.3	2	0.6	0	0.0	10	2.8

3. Results

- 355 (8.9%) of 4008 patients carried ESBL-E.
- Risk factors for ESBL-E included ethnic group (including Asian / Asian British), travel to Asia or Africa in the past 12 months whereas travel to Europe was protective, an overnight stay in an overseas hospital in the past 12 months, and two or more antibiotic courses in the previous 6 months (Table 1). A single course of antibiotics was not associated with ESBL-E carriage.
- 78% of ESBL-E isolates were *E. coli*, and 8.5% *K. pneumoniae*; the microarray did not detect an ESBL-E gene in 25 (7.1%) cases (Table 2).
- ESBL-E genes were detected in 301 (85%) of cases; the vast majority were CTX-M genes (295, 83%), specifically CTX-M-15 (205, 58%).

4. Conclusions

- ESBL-E carriage is associated with travel-related risk factors and multiple antibiotic courses.
- Whereas international guidelines tend to recommend screening for ESBL-E in outbreak settings only,³ our findings suggest that screening patients with a history of travel to high risk countries or hospitalization abroad could help target interventions to prevent transmission of ESBL-E.

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References: 1. Woerther et al. *Clin Microbiol Rev* 2013; 26: 744-58. 2. Woodford et al. *FEMS Microbiol Rev* 2011; 35:736-55. 3. Otter et al. *Clin Microbiol Infect* 2015;21:1057-66.