Trends in Macrolide and Quinolone Resistance in *Campylobacter* Bacteraemia and Risk of Relapse

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INTRODUCTION

- *Campylobacter* spp. are typically gastrointestinal pathogens but can infrequently cause invasive bloodstream infections.
- We aimed to characterize the clinical features of Campylobacter bacteremia in our Southeast Asian cohort.

METHODS

Study Cohort

- Retrospective review of patients with Campylobacter spp. bacteremia at a tertiary hospital in Singapore between 2012 and 2024.

Data collection

- Clinical data, microbiological results, and treatment courses were reviewed to evaluate the emergence of carbapenem resistance and associated outcomes.

Data analysis

- Cases were stratified into two groups: those presenting with gastroenteritis (GE) and those with febrile syndrome without gastrointestinal symptoms, and compared with appropriate bivariate analyses

RESULTS

(1) **Table 1: Clinical characteristics of *Campylobacter* spp. bloodstream infections**

Parameter	Overall (n=24)	Gastroenteritis (n=17)	Febrile syndrome with no gastroenteritis (n=7)	p-value
Age (years)	64 (±17)	65 (±18)	62 (±17)	0.664
Male sex (n, %)	18 (75.0%)	14 (82.4%)	4 (57.1%)	0.195
Hypertension (n, %)	10 (41.7%)	8 (47.1%)	2 (28.6%)	0.404
Hyperlipidemia (n, %)	9 (37.5%)	7 (41.2%)	2 (28.6%)	0.562
Diabetes mellitus (n, %)	9 (37.5%)	8 (47.1%)	1 (14.3%)	0.132
Chronic kidney disease (n, %)	7 (29.2%)	5 (29.4%)	2 (28.6%)	0.967
End-stage kidney disease (n, %)	1 (4.2%)	1 (5.9%)	0 (0.0%)	0.512
Ischaemic heart disease (n, %)	7 (29.2%)	6 (35.3%)	1 (14.3%)	0.303
Chronic liver disease (n, %)	7 (29.2%)	6 (35.3%)	1 (14.3%)	0.303
Immunocompromised state (n, %)	15 (62.5%)	10 (58.8%)	5 (71.4%)	0.562
Community onset bacteraemia (n, %)	22 (91.7%)	16 (94.1%)	6 (85.7%)	0.498
Haemoglobin (g/dL)	10.4 (±2.2)	10.7 (±2.3)	9.3 (±0.7)	0.340
Total white cell count ($x10^9$/L)	7.72 (±3.82)	7.93 (±3.96)	6.79 (±3.70)	0.658
Absolute neutrophil count ($x10^9$/L)	5.62 (±3.34)	5.64 (±3.48)	5.54 (±3.27)	0.962
Serum creatinine (µmol/L)	306 (±678)	362 (±745)	61 (±15)	0.506
Albumin (g/L)	37 (±5)	37 (±5)	38 (±6)	0.615
Bilirubin (µmol/L)	15 (±10)	15 (±11)	13 (±6)	0.763
Aspartate transaminase (U/L)	44 (±34)	45 (±37)	41 (±21)	0.840
Alanine transaminase (U/L)	35 (±33)	34 (±36)	39 (±21)	0.829
Alkaline phosphatase (U/L)	115 (±53)	112 (±41)	127 (±102)	0.672
C-reactive protein (mg/L)	60 (±43)	48 (±38)	102 (±45)	0.125

RESULTS

Table 2: Microbiological characteristics and clinical outcomes of *Campylobacter* spp. bloodstream infections

Parameter	Overall (n=24)	Gastroenteritis (n=17)	Febrile syndrome with no gastroenteritis (n=7)	p-value
Species				0.278
C. jejuni	19 (79.2%)	14 (82.4%)	5 (71.4%)	
C. coli	2 (8.3%)	2 (11.8%)	0 (0.0%)	
C. fetus	1 (4.2%)	0 (0.0%)	1 (14.3%)	
C. urealyticus	1 (4.2%)	0 (0.0%)	1 (14.3%)	
Others	1 (4.2%)	1 (5.9%)	0 (0.0%)	
Antimicrobial susceptibility profile				
Resistant to Ciprofloxacin (n, %)	21/23 (91.3%)	15/17 (88.2%)	6/7 (85.7%)	0.415
Resistant to Erythromycin (n, %)	7/21 (33.3%)	5/16 (31.3%)	2/5 (40.0%)	0.252
Resistant to meropenem (n, %)	0/17 (0.0%)	0/14 (0.0%)	0/3 (0.0%)	-
Stool culture also positive (n, %)	5 (20.8%)	5 (29.4%)	0 (0.0%)	0.107
Required intensive care unit stay (n, %)	2 (8.3%)	2 (11.8%)	0 (0.0%)	0.343
In-hospital mortality (n, %)	0 (0.0%)	0 (0.0%)	0 (0.0%)	-
Relapse of bacteraemia within 1 year (n, %)	3 (12.5%)	2 (11.8%)	1 (14.3%)	0.865

Table 3: Ciprofloxacin and erythromycin resistance rates (all isolates)

Year	Ciprofloxacin resistance	Erythromycin resistance
2012-2015	66.7% (4/6)	20.0% (1/5)
2016-2018	75.0% (9/12)	25.0% (3/12)
2019-2021	100% (5/5)	0.0% (0/5)
2022-2024	90.9% (10/11)	63.6% (7/11)

DISCUSSION AND CONCLUSION

- Twenty-four patients were included, with a median age of 64 years; 75.0% were male. Seventeen patients (70.8%) presented with GE, and 7 (29.2%) without.
- Patients without GE had higher CRP levels
- Most infections were community-onset (91.7%)
- Antimicrobial resistance to ciprofloxacin was high (91.3%), while all isolates were susceptible to meropenem
- Resistance to quinolone and macrolides generally increased over the years. Notably, three cases of relapse of bacteremia occurred in patients whose isolates were resistant to fluoroquinolones, and two were resistant to erythromycin
- No in-hospital deaths were observed, though relapse occurred in 3 patients (12.5%) within 1 year
- *Campylobacter* spp. bloodstream infections may also manifest solely as febrile illness.
- Clinical outcomes generally favourable, but a proportion of patients experienced relapse. Relapse cases may have occurred due to absence of a suitable intracellular-acting antimicrobial, as *Campylobacter* spp. are known for intracellular invasion.

REFERENCES

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