132. Epidemiology, Antimicrobial Resistance and Predictors of Typhoidal and Non-Typhoidal Salmonella Bacteremia in Victoria, Australia

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Background. Salmonella species are major contributors to the global burden of foodborne disease. Typhoidal salmonella is travel associated with travel in high-income settings, non-typhoidal salmonella (NTS) is more commonly associated with locally acquired diarrhoeal disease. We aimed to assess the epidemiology, antimicrobial resistance (AMR) patterns, and clinical markers of Salmonella blood-stream infections (BSI) in Victoria, Australia.

Methods. We conducted a retrospective audit of blood culture results over a 5.5-year period at a large, private pathology provider, in Victoria, Australia. All Salmonella isolates detected in blood between January 2013 and June 2018 were included. Epidemiological, microbiological, AMR and clinical data were extracted from the pathology record and collated for analysis.

Results. Of 27,546 positive blood cultures, 262 were positive for Salmonella spp. (rate 9.51 per 1,000 positive cultures) in 187 episodes. 113 (60%) were NTS (47.8% S. Typhimurium, 9.7% S. Enteritidis), while 74 (40%) were TS (59% S. Typhi and S. Paratyphi). Patients with TS were younger (median age 29 vs. 65, P < 0.0001), more likely to have traveled [OR 125 (95% CI 28.47, 549), but fewer had a positive stool [OR 0.21 (95% CI 0.08–0.58)] than those with NTS. NTS was associated with a higher median CRP [149 vs. 83, P < 0.001] and more frequently associated with an abnormal white cell count (39% vs. 18%, P < 0.003). Quinolone non-susceptibility was stable with time, and occurred more frequently in TS than NTS (71 vs. 23%, P < 0.001). Non-susceptibility to Azithromycin was also common in TS (42%), and increasing with time (P = 0.02). Non-susceptibility to ≥1 antibiotic occurred in 54 (73%) of TS, while 24 (32%) had non-susceptibility ≥2. Ceftriaxone resistance occurred infrequently in both TS and NTS (2% vs. 0%, P = 0.5).

Conclusion. Salmonella is an uncommon cause of BSI in our setting, with similar proportions of TS and NTS. Typhoidal isolates were more likely to be associated with travel, and antimicrobial resistance. Despite this, ceftriaxone remains a reliable option for first-line therapy for both TS and NTS. Quinolone resistance remains common, while Azithromycin resistance has increased with time in TS.

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133. The Changing Phenotypes and Genotypes of Invasive Pneumococcal Isolates From Children in Shenzhen During 2013–2017

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Background. The phenotypes and genotypes of Streptococcus pneumoniae (Spn.) isolated from children with invasive pneumococcal diseases (IPDs) were changed in the years prior to this study. The purpose of this study was to monitor this mutation trend before the introduction of the 13-valent pneumococcal conjugate vaccine (PCV13) in China.

Methods. Strains were isolated from children less than 14 years old between January 2013 and May 2017 in Shenzhen Children’s Hospital. Serotypes, antibiotic resistance, and genotypes of these isolates were determined using capsular swelling, E-test, and multi-locus sequence typing, respectively.

Results. A total of 94 Spn. strains were isolated, which belonged to 15 serotypes. The five most prevalent serotypes were 19F (25.5%), 19A (19%), 14 (17%), 23F (7.5%), and 4 (6.5%). The other 12 serotypes (19C and 15) were non-vaccine types. We found 42 sequence types (STs) for these isolates. The most abundant STs were ST271 (24.4%), ST876 (17%), and ST320 (10.6%), mainly related to 19F, 14, and 19A, respectively. The potential coverage of PCV13 was 87.2%. Among non-meningoitis isolates, the resistance rates to penicillin and ceftriaxone were 0% and 2%. However, the meningitis isolates showed universal resistance to penicillin (80%) and ceftriaxone (20%). Most of these isolates (95.7%) were resistant to erythromycin, and 66 (70.2%) strains carried the ermB gene and 24 (25.5%) strains carried both the ermB and mefA/E genes. Serotype 19A showed the highest minimum inhibitory concentration (MIC) for penicillin than the other serotypes, but no significant difference in penicillin MIC among the three main STs (ST271, ST320, and ST876).

Conclusion. The phenotypes and genotypes of invasive pneumococcal isolates from children in Shenzhen have changed with the passage of time. Compared with PCV7, PCV13 can more effectively protect Chinese children from IPDs. To some extent, these changes are possibly due to the usage of antibiotics and vaccines.

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134. A Comparison of Lyme Carditis in Children and Adults, a Case Series

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Background. Lyme disease is a common entity in Maine, and Lyme carditis is an uncommon manifestation of this disease. This case series describes and compares the presentation, management, and outcomes of Lyme carditis in pediatric and adult populations.

Methods. Charts of pediatric and adult patients with heart block and positive Lyme serologies hospitalized in Portland, Maine between January 2010 and December 2018 were analyzed. Data on medical history, presentation, treatment, and outcomes are described.

Results. Ten children (range 7–17, mean 12.4 years) and 20 adults (range 22–81, mean 41.4 years) were admitted for Lyme carditis in this examined period. All children were presented between July and December. Twenty-six (66%) were male, and 42 (71%) were Caucasian. Twenty (32%) had non-susceptibility to quinolones, and 23 (36%) to penicillin. Both groups had a similar age distribution (69% ≥18 years). There was no difference in clinical outcomes between the long and short duration therapy for treatment of GN-BSI, but should be interpreted cautiously given the smaller sample size.

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135. Clinical and Microbiologic Analysis of Risk Factors for Mortality in Patients with Carbapenem-Resistant Acinetobacter baumannii Bacteremia

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Background. Carbapenem-resistant Acinetobacter baumannii (CRAB) infection is an emerging clinical issue and shows high mortality rates. There are a few studies that have investigated the microbiologic risk factors for mortality in CRAB bacteremia. Aim of this study is to identify the clinical and microbiologic risk factors for mortality in CRAB bacteremia.

Methods. Adult patients with monomicrobial CRAB bacteremia at a 2,700-bed tertiary hospital between December 2012 and December 2018 were retrospectively enrolled in the study. Risk factors for 30-day mortality were evaluated through a detailed clinical and microbiological analysis of study patients. All isolates collected on the first day of bacteremia were subjected to colistin susceptibility testing by broth microdilution and genotyping by multilocus sequence typing (MLST).

Results. A total of 164 patients were enrolled and 90 (55%) died within 30 days. Of the 164 patients, 111 (68%) were male and median age was 66.5 years. The most common MLST genotype was ST191 (80 isolates, 49%), followed by ST51 (14%) and ST74 (13%), and 12 (7%) isolates were resistant to colistin (MIC 24 mg/L). Deceased patients were more likely to have hematologic malignancy, neutropenia, pneumonia, and primary bacteremia; less likely to have solid tumor, catheter-related infection, and biliary tract infection; more likely to have a high Pitt bacteremia score; and less likely to receive appropriate antibiotic treatment, colistin, and combination therapy with
colistin and tigecycline, compared with surviving patients (Table 1). Genotype, colistin MIC, and colistin resistance were not associated with mortality (Figure 1 and 2). In multivariable analysis, neutropenia (aOR, 3.25; 95% CI, 1.18–8.95), biliary tract infection (aOR, 0.20; 95% CI, 0.04–0.99), a high Pitt bacteremia score (aOR, 1.42; 95% CI, 1.20–1.67), and combination therapy with colistin and tigecycline (aOR, 0.36; 95% CI, 0.14–0.92) were independent risk factors for mortality (Table 2).

**Conclusion.** Clinical factors such as the site of infection, severity of bacteremia, and specific combination therapy rather than microbiologic factors contributed to mortality in CRAB bacteremia. Appropriate combination therapy may help improving outcomes in CRAB bacteremia.

| Characteristic of patients or isolates | Decreased patients (n = 99) | Surviving patients (n = 74) | P value |
|--------------------------------------|---------------------------|---------------------------|---------|
| Age, mean ± SD                        | 63.1 ± 16.4               | 60.8 ± 25.7               | 0.12    |
| Male gender                          | 58 (60)                   | 53 (72)                   | 0.33    |
| Underlying disease/condition          |                           |                           |         |
| Hematologic malignancy               | 33 (33)                   | 11 (15)                   | 0.01    |
| Solid tumor                          | 18 (18)                   | 26 (35)                   | 0.03    |
| Chronic kidney disease               | 10 (10)                   | 14 (19)                   | 0.16    |
| Chronic obstructive pulmonary disease | 8 (8)                     | 4 (5)                     | 0.39    |
| Recent chemotherapy                  | 30 (30)                   | 15 (20)                   | 0.06    |
| Recent surgery                       | 20 (20)                   | 18 (24)                   | 0.75    |
| Immunosuppression use                 | 13 (13)                   | 15 (20)                   | 0.52    |
| Sepsal use                           | 31 (31)                   | 15 (20)                   | 0.04    |
| Neutropenia                          | 32 (32)                   | 7 (9)                     | <0.001  |
| Ventilator care                      | 46 (46)                   | 36 (49)                   | 0.07    |
| Charlson comorbidity index, mean ± SD | 3.6 ± 2.5                 | 4.4 ± 2.9                 | 0.07    |

**Type of infection**
- Catheter-related infection: 6 (7)
- Bacteremia of upper airway: 11 (12)
- Biliary tract infection: 2 (2)
- Unknown: 48 (53)
- Skin & soft tissue infection: 5 (6)
- Other: 8 (9)
- Sepsis: 67 (74)

**CRAB isolate characteristics**
- Colistin resistance: 55 (61)
- MIC >1 µg/mL: 36 (49)
- MIC ≤1 µg/mL: 29 (37)
- MIC ≥4 µg/mL: 6 (7)

**Microbiologic sequence type**
- ST19: 43 (48)
- ST14: 13 (14)
- Other: 21 (23)

**Inappropriate empirical treatment**
- 61 (68)
- 46 (48)

**Appropriate empiric treatment**
- 60 (69)
- 62 (69)

**CRAB isolate use for definitive treatment**
- 43 (48)
- 58 (70)

**Combination therapy for definitive treatment**
- 46 (51)
- 74 (48)

**Conclusion.** Clinical factors such as the site of infection, severity of bacteremia, and specific combination therapy rather than microbiologic factors contributed to mortality in CRAB bacteremia. Appropriate combination therapy may help improving outcomes in CRAB bacteremia.

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### Table 1 Clinical and microbiologic characteristics and management of CRAB bacteremia, according to 30-day mortality

#### Table 2 Result of analyses of risk factors for mortality in patients with CRAB bacteremia

**RISK FACTOR**
- **Odds ratio (95% CI)**
- **P value**
- **Odds ratio (95% CI)**
- **P value**

**Solid tumor**
- 0.46 (0.23 - 0.93)
- 0.03

**Hematologic malignancy**
- 2.72 (1.30 - 5.67)
- 0.01

**Neutropenia**
- 5.28 (1.72 - 16.86)
- 0.000

**Catheter-related infection**
- 0.28 (0.10 - 0.77)
- 0.01

**Biliary tract infection**
- 0.08 (0.00 - 0.34)
- 0.00

**Pneumonia**
- 3.31 (1.70 - 6.44)
- 0.000

**Primary bactemia**
- 3.45 (1.21 - 9.60)
- 0.02

**Septic shock**
- 7.87 (1.99 - 31.16)
- 0.000

**Pitt bacteremia score**
- 1.53 (1.12 - 2.07)
- 0.01

**Inappropriate definitive treatment**
- 3.44 (1.63 - 7.29)
- 0.001

**Colistin use for definitive treatment**
- 0.44 (0.23 - 0.83)
- 0.01

**Combination therapy with colistin and tigecycline**
- 0.46 (0.21 - 0.99)
- 0.04

**Figure 2. 30-day mortality according to genotype of CRAB blood isolates**

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### Table 30-day mortality according to colistin MIC of CRAB blood isolates

**Figure 3. 30-day mortality according to colistin MIC of CRAB blood isolates**

### Table 136. Factors Associated with Reduced Vancomycin Susceptibility in Pediatric *Staphylococcus aureus* Bacteremia

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**Background.** Vancomycin is often used empirically for treatment of pediatric *Staphylococcus aureus* bacteremia while susceptibility testing is being performed. Reduced vancomycin susceptibility (RVS) occurs when the minimum inhibitory concentration (MIC) for vancomycin is elevated, potentially resulting in decreased efficacy. Patient factors associated with RVS in pediatric *S. aureus* infections have not been well studied.

**Methods.** Children aged <18 years admitted from 2012 to 2016 to two tertiary care children's hospitals with a bloodstream infection caused by *S. aureus* were identified. Demographics, presence of comorbidities, hospitalizations in the year prior to the infection, surgical procedures in the 30 days prior to the infection, site of infection, and laboratory reports for all *S. aureus* bloodstream infections identified during the study are from 2012 to 2016 were abstracted from the electronic medical record using a structured data collection form. RVS was defined as a MIC >1 µg/mL as reported by the clinical microbiology laboratory. Wilcoxon rank-sum and Fisher's exact test to compare continuous and categorical variables, respectively. A multivariable logistic regression model was used to evaluate the association of RVS with patient factors, MRSA vs. MSSA, admitting hospital, and year.

**Results.** We identified 221 *S. aureus* bloodstream infections. Most (84%) had RVS though there were differences by the hospital, 74% vs. 87%, P = 0.037. Bloodstream infections in the setting of a musculoskeletal infection were most common (36%), followed by central line-associated bloodstream infections (22%). The median age was similar between RVS and non-RVS infections, 3 (25th, 75th %tiles: 0, 9) but, when adjusted for patient factors, younger children were more likely to have RVS infections, aOR: 0.92 (0.85, 0.99).

**Conclusion.** RVS is common among pediatric *S. aureus* bloodstream infections and appears to be influenced by patient age and race but not by the source of the infection or other clinical factors.

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### Table 137. Impact of Rapid Susceptibility Testing on Outcomes in Patients with Bacteremia

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