Background: The Study for Monitoring Antimicrobial Resistance Trends (SMART) has monitored the in vitro susceptibility of aerobic gram-negative bacilli (GNB) from intra-abdominal infections since 2002. Since participating sites each collect up to 100 consecutive non-selected aerobic gram-negative bacilli (GNB) each year, the distribution of species is fairly representative of typical pathogens. Methods: A total of 241,197 GNB were collected from adult and pediatric patients at 201 hospitals in 52 countries in 2010 and 2011. MICs were determined by broth microdilution, and interpreted using CLSI guidelines. Isolates were deemed community-associated (CA) or hospital-associated (HA) if specimens were collected >48 hours after admission to hospital. Results: The total number of isolates, proportion of the total, and rank for each aerobic gram-negative species are listed by age group and hospital (HA) vs. community (CA) below.

Conclusions: Although there were some differences, the distribution of GNB was similar in HA and CA IAI in adult and pediatric patients, with E. coli, K. pneumoniae, P. aeruginosa, and E. cloacae accounting for >75% of isolates. As expected, ESBL+ rates were generally lower in CA IAI and pediatric patients. Empirical antimicrobial therapy of adult and pediatric HA and CA IAI needs to cover similar organisms, with somewhat higher resistance likely to be encountered in HA IAI in adult and pediatric patients.

Materials & Methods

- Participating sites each collected up to 100 consecutive non-selected aerobic gram-negative bacilli from intra-abdominal infections each year of the study. Only one isolate per species per patient was accepted into the study. For this report, 24,197 GNB isolates were collected in 2010 and 2011, at 201 hospitals in 52 countries. Combined susceptibility was calculated for the 11 most frequent species (each with n>390 globally). These constituted 95% of all isolates. The combined susceptibility was calculated using breakpoints appropriate for each species and drug. Susceptibility was compared for species with no breakpoints available for a given drug. An isolate was deemed hospital-associated (HA) if the specimen was cultured >48 hours post admission to hospital, and community-associated (CA) if the specimen was cultured <48 hours post admission to hospital. Pediatric patients were defined as 0-17 years old, adults as 18 years or older.
- Isolates were identified to the species level, and sent to a central lab (International Health Management Associates, Inc., Schaumburg, IL, USA) for susceptibility testing and confirmation of identification.
- Isolates collected in China were sent to a central lab in Beijing (Peking Union Medical College) for susceptibility testing and confirmation of identification, using the same susceptibility testing panels as IHMA.
- Organism collection, transport, confirmation of organism identification, susceptibility testing, and development and management of a centralized database were coordinated by IHMA.
- Minimum inhibitory concentration (MIC) breakpoints were determined by the Clinical and Laboratory Standards Institute (CLSI) and interpreted using standard tables provided by the panel manufacturer.
- MIC interpretive criteria were followed published guidelines of the CLSI.
- Escherichia coli, Klebsiella pneumoniae, and Proteus mirabilis isolates were classified as ESBL producers if there was at least an eight-fold reduction of MIC for cefotaxime or ceftazidime tested in combination with clavulanic acid versus their MICs when tested alone [5].
- Quality controls (QC) were performed on each day of testing using appropriate ATCC control strains, following CLSI and CLSI guidelines.
- MIC interpretive criteria followed published guidelines of the CLSI [5].

Conclusions

- The distribution of GNB was similar in HA and CA IAI in adult and pediatric patients, in that the top 11 species were the same in all four groups; E. coli, K. pneumoniae, P. aeruginosa, and E. cloacae accounting for >75% of all isolates) were the top 4 species in all groups. The group of CA IAI in pediatric patients was the most similar, with a much higher proportion of E. coli isolates and a lower percentage of K. pneumoniae, E. cloacae, and K. aero.
- As expected, ESBL+ rates were always lower in CA IAI than in HA infections. Comparing age groups, ESBL+ E. coli and K. oxytoca rates were lower in pediatric patients than in adults, but ESBL+ K. pneumoniae were statistically significantly higher in pediatric patients. The particular high rate of ESBL+ K. pneumoniae found in pediatric HA IAI seems to be somewhat skewed by isolates from two countries. Almost 20% of the pediatric HA IAI isolates came from one hospital in Hungary and one site in Malaysia with ESBL+ rates of 79 and 63%, respectively. Without these two hospitals the rate in pediatric HA IAI would be 48% (95% confidence interval: 38-58%) - data not shown.
- The combined susceptibility results mirrored the ESBL findings, with CA IAI isolates always more susceptible than HA strains and pediatric isolates. It is much more likely to be susceptible from organisms from adult patients than from pediatric patients.
- The distribution of susceptibility from adult and pediatric HA IAI needs to cover similar organisms, with somewhat higher resistance likely to be encountered in HA IAI in adult and pediatric patients.

References