Epidemiology of Extended-Spectrum Beta-lactamase (ESBL) Producing Enterobacteriaceae in the South East Tennessee, October-December 2017

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Introduction

- ESBL producing Enterobacteriaceae has become the most common multi drug resistant pathogen in the last three decades. These organisms confer resistance to most beta-lactam antibiotics, including penicillins, 3rd generation cephalosporins, monobactam and tazobactam.
- The most common organisms harboring ESBL characteristics are gram negative Enterobacteriaceae family *E.coli* and *Klebsiella* species.

Methods

Surveillance Catchment Area

- Tennessee Health Department (TDH) collaborated with CDC to pilot population based surveillance of ESBL producing organisms during the last three months of 2017 (October to December).
- A case was defined as isolation of *E. coli, Klebsiella pneumoniae, or Klebsiella oxytoca* resistant to at least one extended-spectrum cephalosporin (ceftazidime, cefotaxime or ceftriaxone) and non-resistant to all carbapenem antibiotics from urine or normally sterile body sites from a resident of the surveillance catchment area.
- A line list of ESBL producing organisms was received from the labs that serve the catchment population.
- Case report form was completed for the first ESBL culture collected from a single patient in a 30 day period.
- A sample of isolates were collected for molecular characterization.

Results/Figures

- A total of 154 cases were identified during the study period.
- E.coli constitutes 92.2% of the ESBL producing organisms followed by *Klebsiella pneumonia* (5.2%) and *K. oxytoca* (2.6%).
- The estimated annual incidence rate was 400.7 per 100,000 population which is more than twice the average rates in other sites that conducted similar studies.
- The most common source was urine (97%), and 81.2% of the cases were female.
- The age ranges from 3-99 years with average of 67 years and 81.2% were female.
- Thirty-two isolates were tested for sequence typing and 76.7% (23) of the isolates were ST 131. 21 (91.3%) of ST-131 isolates were resistant to ciprofloxacin.

Table 1: Incidence Rate by Sites Oct-Dec 2017

Site	# of Incident Cases	Population	Oct.-Dec. 2017 Incidence/ 100, 000	Estimated Annual Incidence/ 100, 000
State A	65	322,514	20.0	80.6
State B	33	285,153	11.6	46.3
State C	314	676,773	46.4	185.6
State D	325	747,642	43.5	173.9
Tennessee	154	153,712	100.2	400.7
Total	891	2,185,793	40.8	163.2

Figure 1: Reported ESBL Organisms by Species

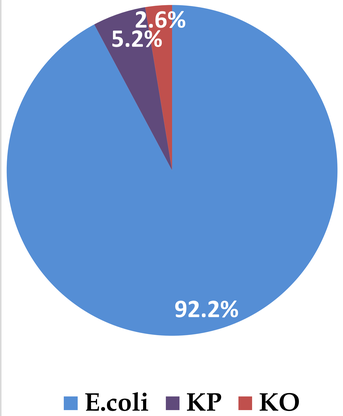
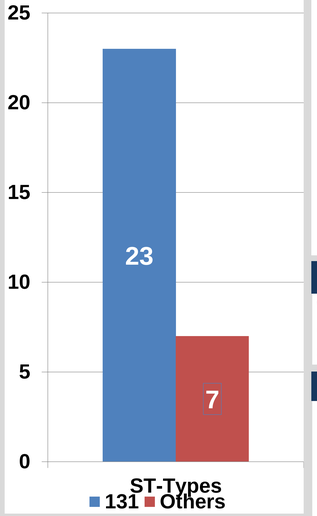


Figure 2: ESBL Organisms by Types



Discussion and Conclusions

The study revealed that the incidence of ESBL producing organism is very high in Tennessee study area compared to other states that conducted similar studies. The most common ESBL producing pathogen reported in the study area was found to be ST 131 and most of these were resistant to ciprofloxacin suggesting that resistance to fluoroquinolone may be co-transmitted in ESBL producing pathogens through plasmids. The high prevalence of ESBL producing pathogens in the area and the emergence of strains resistant to other antibiotics poses a challenge to the clinicians limiting the available therapeutic options. Continued surveillance and understanding the burden and the molecular characteristics of ESBL producing pathogens is important to guide the infection prevention and antimicrobial stewardship programs to reduce the spread of drug resistant pathogens.

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