Background: The Study for Monitoring Antimicrobial Resistance Trends (SMART) has been tracking resistance among Gram-negative bacilli (GNB) since 2002. GNB resistance has been on the rise since then, with a parallel increase of the number of acquired carbapenemases. This report summarizes the susceptibility and molecular characterization of broad spectrum beta-lactamases isolated from intra-abdominal infections (IAI) in Lebanese and Jordanian SMART centers during a 6-years period.

Materials/methods: 670 consecutive gram-negative pathogens from IAI were collected from four hospitals and centers in Lebanon (202; n=2) and Jordan (468; n=2) (2011-2016). The isolates were then shipped to a central laboratory (IHMA, Switzerland) to confirm the identification and susceptibility testing and perform the molecular characterization. Extended spectrum beta-lactamases (ESBLs) and carbapenemases were characterized using the Check-Points microarray, followed by PCR and sequencing. We characterized all Enterobacteriaceae that were non-susceptible to ertapenem (using CLSI breakpoints), and 50% (due to cost constraints) of the isolates that were phenotypically ESBL-positive but ertapenem susceptible.

Results: Susceptibility rates of ESBL-producing isolates comparatively between Lebanon and Jordan and the molecular data are presented in Figure 1. In general, these isolates still have high susceptibility rates to imipenem, ertapenem and amikacin over the years. A drop in carbapenem susceptibility rates could be noted especially in Jordan, that could be explained among others by the emergence of carbapenemases such as $bla_{OXA}$-type (mainly $bla_{OXA-48}$ but also an outbreak of 7 strains with $bla_{OXA-181}$ in 2016) and $bla_{NDM}$-type carbapenemases. The detailed description of the molecular characterization demonstrated an overall higher number of strains with resistance and a higher rate of specific resistance types in Jordan compared to Lebanon. Moreover, in Jordan, a statistically significant higher rate was noted for OXA-type and for the CMY-type (between 2011 and 2016). Finally, $bla_{CTX-M-15}$ remains the most prevalent ESBL and $bla_{OXA-48}$ the most prevalent carbapenemase.

Conclusions: The analysis of molecular data is essential in understanding changes in susceptibility rates over the years. Such combined information greatly supports the development of effective antimicrobial stewardship initiatives. Importantly, this study showed that an effective containment plan is urgently needed to control the growth of the devastating problem of resistance, particularly in Jordan.
Figure 1: SMART data susceptibility and molecular characterization in IAI infections in Lebanon and Jordan (2011-2016).

LEBANON: SMART DATA 2011-2016;
Susceptibility rates of ESBL IAI Enterobacteriaceae and molecular data.

JORDAN: SMART DATA 2011-2016;
Susceptibility rates of ESBL IAI Enterobacteriaceae and molecular data.