

Session: EV026 Resistance surveillance & epidemiology: Gram-negatives

Category: 3b. Resistance surveillance & epidemiology: Gram-negatives

22 April 2017, 08:45 - 15:30
EV0499

Multidrug-resistant Enterobacteriaceae are more prevalent among diabetic patients than non-diabetics in Kuwait

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Background: Kuwait has one of the highest rates of diabetes amongst its population in the world (7th). Therefore, clinicians routinely treat diabetic patients with a wide range of infections. In this study, our objective was to identify if in Kuwait multi-drug resistant (MDR) Enterobacteriaceae are more ubiquitous in diabetic patients than non-diabetics.

Material/methods: 114 Enterobacteriaceae isolates were collected from three hospitals, 65 from diabetics 49 isolates from non-diabetics. Identification was conducted using VITEK2[®] or MicroScan Walk-Away[®]. MDR was defined as an isolate resistant to at least 1 antibiotic from 3 different classes. PCR was performed for *bla*_{CTX-M}, *bla*_{TEM}, *bla*_{SHV}, *bla*_{OXA}, *bla*_{NDM}, *bla*_{VIM}, *bla*_{IMP}, *bla*_{KPC}, *bla*_{GIM}, *bla*_{CTX-M}, *qnrA*, *qnrB*, *qnrS*, *aac(6)-Ib-cr*, *pmrB* and *mcr-1*. PFGE was conducted on *E. coli* and *K. pneumoniae* using XbaI. Isolates were considered to belong to the same clone if their Dice similarity index was $\geq 85\%$. SPSS v.14.0 was used to analyse variables.

Results: The most prevalent isolates recovered from both diabetics and non-diabetics groups were *E. coli* (n=67) and *K. pneumoniae* (n=15). Antibiotic resistance was higher among the diabetic patients in particular with ampicillin (P-value ≤ 0.001), amoxicillin/clavulanate (P-value ≤ 0.001), cefuroxime (P-value ≤ 0.001), cefotaxime (P-value ≤ 0.014), ceftazidime (P-value ≤ 0.001), sulfamethoxazole/trimethoprim (P-value ≤ 0.029) and ciprofloxacin (P-value ≤ 0.001). MDR isolates

were more abundant in our diabetic group compared to the non-diabetic group (DM=78.5%, NDM=46.9%) (P-value ≤ 0.001). Three *K. pneumoniae* isolated from diabetics were colistin resistant with MICs of 32 -128 mg/L. We did not detect *pmrB* and *mcr-1*. In the diabetic group there were *bla*_{TEM-1} (n=33), *bla*_{CTX-M-15} (n=23) and *bla*_{SHV-2} (n=9) –producing isolates. In comparison, the non-diabetic group contained *bla*_{CTX-M-15} (n=8), *bla*_{TEM-1} (n=7) and no *bla*_{SHV}. In this study 68% of ciprofloxacin resistant isolates were ESBL producers, of which, 52% expressed *bla*_{TEM-1} and 32% *bla*_{CTX-M-15}. The most common genes detected amongst ciprofloxacin resistant isolates were *aac* (6')-Ib-cr variant (n=29), *qnrS1* (n=4) and *qnrB1* (n=3). Resistance to imipenem was more frequently detected among diabetics compared to non-diabetics (11% vs 2%). Two carbapenem resistant *K. pneumoniae* recovered from two diabetics contained *bla*_{OXA-232}. Both *E.coli* and *K. pneumoniae* showed diversity in their PFGE patterns

Conclusions: The prevalence of multi-drug resistant multi clonal Enterobacteriaceae causing infections in diabetic patients in Kuwait is higher than in the non-diabetic patients (P-value ≤ 0.001). It is important to monitor and to control the spread of MDR isolates by administering the correct antibiotics. Health professionals should be aware to identify diabetics when dispensing antibiotics.