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

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Introduction

Kuwait has one of the highest rates of diabetes amongst its population in the world(1). It has been proven that diabetic patients are more prone to infections.(2) This could place them at a higher risk of contracting multi drug resistant (MDR) bacteria, including members of the Enterobacteriaceae family, which are common causative agents in diabetic infections(3). 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.

Materials and Methods

Sample collection:

- 114 Enterobacteriaceae isolates were collected from three hospitals, 65 from diabetics 49 isolates from non-diabetics.

Identification and antimicrobial susceptibility testing:

- Identification & susceptibility profiles were conducted using VITEK2® or MicroScan Walk-Away®. MDR was defined as an isolate resistant to at least 1 antibiotic from 3 different classes. MIC for colistin resistant isolates was conducted.

Genotypic analysis:

- PCR & sequencing was performed for *bla*$_{CTX-M}$, *bla*$_{TEM}$, *bla*$_{SHV}$, *bla*$_{OXA}$, *bla*$_{NDM}$, *bla*$_{VIM}$, *bla*$_{IMP}$, *bla*$_{KPC}$, *bla*$_{GIM}$, *qnr*A, *qnr*B, *qnr*S, *aac(6')-Ib-cr*, *pmr*B 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 ≥85%.

Statistical analysis:

- Chi squared was used using the software SPSS v.14.0 to analyze variables .

Results

Antibiotic and Multi drug resistance:

- Antibiotic resistance and MDR was higher among the diabetic patients (Figure 1) with a significant difference in particular to the antibiotics mentioned in Table 1.
- Three *K. pneumoniae* isolated from diabetics were colistin resistant with MICs of 32 -128 mg/L.

Polymerase chain reaction:

- All antibiotic resistance genes were more common among the diabetic infections, except for *bla*$_{CTX-M-15}$ & *aac(6')-cr-Ib*. (Figure 2).
- Two carbapenem resistant *K. pneumoniae* recovered from two different diabetic patients contained *bla*$_{OXA-232}$.

PFGE:

- Two *E.coli* obtained from two different diabetics had identical banding patterns. Two *K. pneumoniae* from two different diabetics also had identical banding patterns. However nearly all isolates showed diversity in their PFGE patterns.

Results

Figure 1: Antibiotic resistance

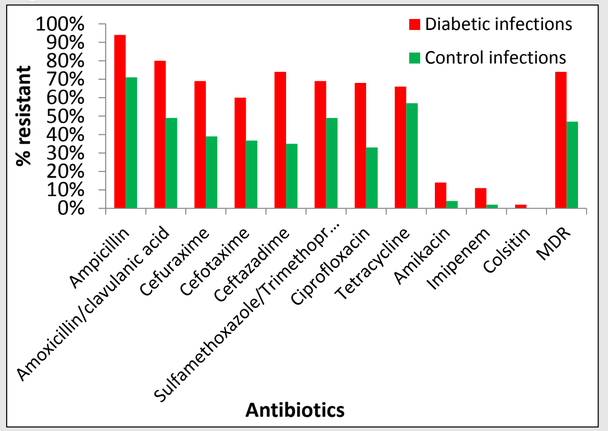

Figure 2: Amplified PCR products

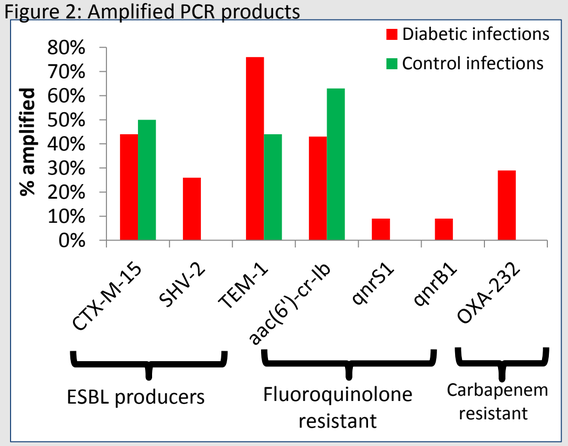

Table 1: P-values of antibiotic resistance

Antibiotic	DM (% resistant)	Control (% resistant)	P-value
Ampicillin	93.8%	71.4%	<0.001
Amoxicillin/clavulanic acid	80%	49%	<0.001
Cefuroxime	69.2%	38.8%	<0.001
Cefotaxime	60%	36.7%	<0.014
Ceftazidime	73.8%	34.7%	<0.001
Sulfamethoxazole/trimethoprim	69.2%	49.0%	<0.029
Ciprofloxacin	68%	32.7%	<0.001
MDR	74%	47%	<0.001

Conclusions

The prevalence of MDR 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.

References

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