INTRODUCTION

Carbapenem-Resistant-Enterobacteriaceae constitute an important public health. The most common mechanisms observed responsible of this resistance in Enterobacterial species are part of Ambler class A (KPC), B (VIM, IMP) and D (OXA-48-like) β-lactamases. Production of NDM-1, CTX-M-15, KPC, and OXA-48-like β-lactamases appear in a widespread pattern in India, Pakistan, USA and Turkey. In Tunisia, resistance to carbapenem in Enterobacteriaceae is generally associated to the production of OXA-48-like β-lactamases. The present study was performed to investigate the molecular basis of carbapenem resistance in Enterobacteriaceae isolated in the University Hospital Tahar Sfar in Mahdia, Tunisia in a three year period.

Material and Methods

From 2013 to 2015, 10 Enterobacterial strains resistant to ertrapenem according to EU-CAST guidelines were isolated from various clinical infections in several wards, including orthopaedics (3 isolates), intensive care unit (2 isolates), urology (1 isolates) and 1 isolate from the medicine, surgery, pediatric and pneumology wards, respectively. Isolates were identified by MALDI-TOF as Klebsiella pneumoniae strains. Antimicrobial susceptibility was performed by disc diffusion. Genetic characterization was performed by PCRs for the detection of \(blac_{\text{CTX-M-15}}\), \(blac_{\text{SHV}}\), \(blac_{\text{KPC-3}}\), \(blac_{\text{OXA-48}}\), and \(blac_{\text{NDM-1}}\) genes. Isolates were sequenced and plasmids were characterized by rep-typing (Diatheva) and Southern blot on S1-PFGE gels. Clonality was assessed by PFGE and MLST.

Results

The PCR results showed that 8 strains harbored the \(blac_{\text{NDM-1}}\) gene, 2 strains had the \(blac_{\text{OXA-48}}\) gene, whereas the \(blac_{\text{KPC-3}}\), \(blac_{\text{SHV}}\), and \(blac_{\text{OXA-48}}\) genes were not detected. All isolates produced CTX-M-1 extended-spectrum β-lactamase; sequencing lead to the identification of 7 CTX-M-15 and 3 CTX-M-1 producing strains. All strains but one harbour 3 plasmids of the IncI, IncFIIk and IncR families. One strain (M4) has 1 plasmid of the IncX2 family. As demonstrated by S1 nuclease-Pulsed Field Gel Electrophoresis (S1-PFGE) and Southern blot on S1-PFGE gels. Clonality was assessed by PFGE and MLST.

CONCLUSION

Here, we report an increased prevalence of carbapenemase-producing Enterobacteriaceae in the University hospital Tahar Sfar in Mahdia. This work highlights the ability of OXA-48-like carbapenemase to spread among enterobacteriaceae. This is also the first description of an ST 147 K. pneumoniae isolates carrying the \(blac_{\text{NDM-1}}\) gene in a Tunisian hospital. Finding are of great epidemiologic and clinical interest.