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Phenotypic and genotypic detection of carbapenemase enzymes producing Gram-negative bacilli isolated from patients in Khartoum state

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Background & Aim: Carbapenem used as antibiotics of a last resort for treating infections due to multidrug-resistant Gram-negative bacilli. However, emergence of Carbapenem resistant Gram-negative bacilli has been reported due to the production of carbapenemase enzymes, which significantly limits treatment options for life-threatening infections. This study aimed to detect carbapenem resistant Gram-negative bacilli from patients attending different hospitals in Khartoum state, and to detect carbapenemase enzyme production by phenotypic and genotypic methods.

Methods: A hospital-based cross sectional study was conducted in Khartoum state in the period from February to August 2016. 149 Gram-negative bacilli bacteria were isolated from different clinical specimens. Blood agar, CLED media, MacConkey agar, XLD media, Chromogenic agar media and standard biochemical tests were used for isolation and identification of Gram-negative bacilli from different samples. Standard antimicrobial susceptibility testing to carbapenem antibiotic was performed for all isolates, then detection of carbapenemase enzymes production for the resistant isolates was performed using modified Hodge test and PCR.

Results: 149 Gram-negative bacilli were isolated from 147 different clinical specimens. The most predominant Gram-negative bacilli isolate was *Escherichia coli* (54.4%) followed by *Klebsiella* species (29.5%). More than 50% of the isolates were carbapenem resistant. 56% of the resistant isolates were positive by modified Hodge test. By using PCR, 17.3% of resistant organisms harbored the blaOXA48 gene and 6.7% harbored the blaIMP gene. *E. coli* was the most predominant bacteria that harbored the blaoxa48gene followed by *Klebsiella* species. blaIMP gene was harbored only by *E. coli*.

Conclusion: The percentage of resistance to carbapenems due to production of carbapenemase enzymes is very high in Sudan. blaOXA48 gene is more predominant than blaIMP in this study. Further studies including larger sample size, using of other primers set and specific tests for detection of carbapenemase enzymes and other mechanism of carbapenem resistant will be of a great value.

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