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### Abstract

**Background:** Microorganisms resistant to both antibiotics and metals have been isolated from nosocomial and urinary tract infection. Most heavy metal-resistant hospital infections including *Klebsiella pneumoniae* (*K. pneumoniae*) harbor plasmids with different molecular sizes. The aim of this study was the molecular detection of simultaneous occurrence of antibiotic and heavy metal resistance in *Klebsiella* isolated from urinary tract infection (UTI).

**Methods:** Overall, 144 *K. pneumoniae* strains were isolated from UTI samples in the laboratories of hospitals and clinics. Primary selection of  $\beta$ -lactam-resistant strains was conducted using combined disk and double-disk (DD) synergy methods according to the guidelines of Clinical and Laboratory Standards Institute (CLSI). Polymerase chain reaction (PCR) was also performed to detect TEM-1 and SHV-1 genes in resistant strains. Minimal inhibitory concentrations (MICs) of the heavy metals were determined for Hg<sup>2+</sup>, Cu<sup>2+</sup>, Pb<sup>2+</sup>, and Cd<sup>2+</sup>.

**Findings:** Among the 61.81% antibiotic-resistant strains, 42.69% were  $\beta$ -lactamase producers. After performing PCR, from 38 positive extended spectrum beta lactamase (ESBL) strains, 28.94% of *Klebsiella* strains harbored SHV gene and 77.1% harbored TEM gene. The highest resistance was to Hg<sup>2+</sup> (35 mg/L), Cu<sup>2+</sup> (650 mg/L), Pb<sup>2+</sup> (350 mg/L), and Cd<sup>2+</sup> (200 mg/L). A significant difference was observed between antibiotic-resistant and heavy metals-resistant strains ( $P = 0.012$ ).

**Conclusion:** Plasmid-carrying isolates that showed resistant to heavy metals were highly resistant to antibiotics. The results showed that it is possible for the plasmids which carry genes for resistance to antibiotics and heavy metals to be exchanged by bacterial strains.

**Keywords:** Heavy metal, TEM, SHV, Antimicrobial resistance, Minimal inhibitory concentration

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