Abstract

The emergence of carbapenem-resistant *Escherichia coli* (*E. coli*) has become a significant public health concern, complicating the treatment of infections caused by multidrug-resistant strains. Meropenem-vaborbactam, a novel combination of a carbapenemand a β-lactamase inhibitor, has shown promise in overcoming resistance mechanisms in carbapenem-resistant Enterobacteriaceae. This present study investigates the antimicrobial activity of meropenem-vaborbactam against carbapenem-resistant *E. coli* and employs polymerase chain reaction (PCR) toidentify the presence of resistance genes. Clinical isolates of carbapenem-resistant *E. coli*were collected from Jinnah hospital, Lahore. Urine samples had the highest frequency (37.05%) followed by Blood samples (22.33%), wound swabs (13.19%)and other types. Outofthetotalsamples, 197 samples wereofcarbapenemresistant *E coli* confirmed through biochemical tests like catalase, oxidase, TSI, Citrate etc. and throughculturesondifferent media likeMacConkeyagar, bloodagar, CLEDagar and chocolate agar. The antimicrobialefficacyofcarbapenemantibiotics and meropenem- vaborbactam were evaluated through susceptibility testing (Disc-diffusion method) and minimum inhibitory concentration (MIC) was determined through VITEK-2.PCR assays were conducted to identify carbapenemase genes, such as (blaKPC, blaNDM, blaOXA-48, and blaIMP). The results confirmed the presence of carbapenemase genes (e.g., KPC, NDM, IMP and OXA-48) in the majority of the isolates. Among the carbapenem-resistant strains of*E. coli*,the OXA-48 gene was the most commonly detected, particularly showing resistance to Meropenem Vaborbactam.

The synergistic effect of vaborbactam in restoring meropenem activity was analyzed, and results were compared with other carbapenem-based treatments. Limited activity is shown by meropenem vaborbactam against carbapenem-resistant *Escherichia coli*, with a susceptibility rate of only 24.5%. It still constitutes an important treatment option in relation to such multidrug-resistant (MDR) organisms. Although effectiveness is rather compromised, the possibility of investigating further combination therapies for improving treatment approaches toward these infections is possible.Exploringnewdrugcombinationscouldhelpovercomethelimitationsof

meropenem-vaborbactamandleadtobetteroutcomesforpatientssufferingfrom infections caused by carbapenem-resistant bacteria.