Determination of Minimum Inhibitory Concentration of Antibiotic-Resistant Bacteria Isolated from Coastal Water Against Ciprofloxacin and Co-Amoxiclav

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Antimicrobial resistance (AMR) has emerged as a major environmental and public health challenge worldwide. Coastal waters are increasingly recognized as reservoirs of resistant microorganisms due to continuous discharge of antibiotics, resistant bacteria, and resistance genes through wastewater, agricultural runoff, hospital effluents, and industrial waste. These contaminants create selective pressure that promotes the persistence, proliferation, and horizontal transfer of resistance among microbial communities. This study evaluated the susceptibility of Antibiotic-Resistant Bacteria (ARB) isolated from Sri Lankan coastal waters to ciprofloxacin and co-amoxiclav, two commonly used antibiotics. A total of 120 bacterial strains previously isolated from the Jaffna and Southern regions, with 60 isolates obtained from each region, were tested using agar dilution techniques at antibiotic concentrations ranging from 60 to 360 µg/mL. Minimum Inhibitory Concentrations (MIC) and Multiple Antibiotic Resistance (MAR) indices were determined. Region-wise analysis showed markedly higher resistance to ciprofloxacin among Jaffna isolates, with 63.3% exhibiting MIC values above 180 µg/mL and 50% surviving at 360 µg/mL. Southern isolates demonstrated comparatively lower resistance, with 53.3% exceeding 180 µg/mL. Co-amoxiclav displayed stronger inhibitory activity overall, with approximately 50% of isolates inhibited at 60–120 µg/mL. However, Jaffna strains again showed greater tolerance, with nearly 50% surviving at MIC levels up to 360 µg/mL for both antibiotics. MAR index values ranged from 0.33 to 1.00, with MAR values of 1.00 predominantly observed among Jaffna isolates, indicating widespread multidrug resistance. These findings confirm that coastal waters in both regions act as reservoirs of multidrug-resistant bacteria, with a heavier resistance burden in Jaffna. The co-occurrence of resistance to fluoroquinolone and β-lactam antibiotics suggests multiple mechanisms, including efflux systems, enzymatic degradation, target-site modification, and mobile genetic elements facilitating gene transfer. Continuous AMR surveillance in marine ecosystems, improved wastewater treatment, and stricter regulation of antibiotic discharge are required to limit the spread of environmental resistance.

Keywords: *Ciprofloxacin, Co-amoxiclav, Antibiotic resistance, Minimum Inhibitory Concentration, Environmental microbiology*