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Antibiotic Susceptibility Profiling of *Escherichia coli* Isolates from Inland Reservoirs Against Selected Antibiotics

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Abstract

Antibiotic resistance is a critical global concern, extending beyond clinical settings into freshwater ecosystems due to improper antibiotic use and inadequate waste management. In Sri Lanka, inland reservoirs play a key role in irrigation but are increasingly contaminated with antibiotic-resistant bacteria through urban runoff, sewage discharge, and agricultural activities. *Escherichia coli*, a primary faecal contamination indicator, frequently harbors resistance genes, making it a vital target for environmental antimicrobial resistance (AMR) monitoring. This study evaluated the antibiotic susceptibility of *E. coli* isolates collected from major Sri Lankan reservoirs located in the Central, Western, North Western, Eastern, and North Central provinces of Sri Lanka against seven antibiotics: Amoxicillin, Cloxacillin, Tetracycline, Oxytetracycline, Piperacillin, Cefotaxime, and Ceftazidime. Water samples were collected from 24 sampling sites in triplicates, and *E. coli* was isolated using standard microbiological and biochemical methods. Antibiotic susceptibility was assessed using the agar dilution method (60-360 µg/ml) in accordance with Clinical and Laboratory Standards Institute (CLSI) guidelines, and the Multiple Antibiotic Resistance (MAR) index was calculated to evaluate environmental antibiotic exposure. Results showed complete resistance (100%) to Amoxicillin and Cloxacillin at 360 µg/mL, indicating reduced effectiveness of these β-lactam antibiotics. Resistance to Tetracycline and Oxytetracycline was comparatively lower (15.6% and 6.3%, respectively). Resistance to third-generation antibiotics was moderate at 60 µg/mL (Cefotaxime 18.8%, Ceftazidime 40.6%, Piperacillin 28.1%) and absent at 360 µg/ml. All MAR index values exceeded 0.2 at 60 µg/mL, reflecting significant environmental exposure to antibiotics. The observed resistance patterns suggest the presence of highly resistant *E. coli* strains, potentially facilitated by horizontal gene transfer. These findings underscore the urgent need for stricter antibiotic regulation, controlled over-the-counter access, and improved wastewater management. They also highlight the importance of establishing a national AMR surveillance system under the One Health framework. Future studies should focus on resistance gene profiling, antibiotic residue quantification, and elucidating mechanisms of resistance dissemination to inform effective mitigation strategies and safeguard public health.

Keywords: *Escherichia coli, Antibiotic resistance, MAR index, Recreational water bodies, public health.*