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Prevalence of antibiotic resistance in surface water, ground water and sediment in the transition zone of the Kelani River basin, Sri Lanka

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Antibiotics are mainly used to treat and prevent diseases in humans and animals, and they also serve as growth promoters and feed efficiency enhancers in agriculture and animal husbandry. However, antibiotic-resistant bacteria (ARB) have emerged as a result of antibiotic overuse and misuse. The prevalence of ARB becomes more critical, particularly for rivers that fulfil urban drinking water demand. Furthermore, the ARB poses a significant threat to human health by potentially treatments ineffective and leading to the spread of untreatable infections. This study aims to screen the presence of ARB against selected antibiotics such as Ciprofloxacin (CIP), Cefuroxime (CXM), Cloxacillin (CLOX), Amoxicillin (AMX), Co-Amoxiclav (CO-AMX); Tetracycline (TC); Azithromycin (AZT), Erythromycin (ERM); Sulfamethoxazole (SMX) and Gentamycin (GEN) in the transition zone of Kelani River Basin, Sri Lanka. Samples were collected during the first inter-monsoon season in March 2024. Twenty-five water samples (groundwater - 07; surface water - 18) and 12 sediment samples were subjected to determine Total Viable Count (TVC) and ARB using the standard pour plate method at 60 mg/L of antibiotic. The TVC of bacteria ranges between $0.2 \times 10^2 - 4.0 \times 10^2$ CFU/mL in collected surface water samples, whereas $0.2 \times 10^2 - 2.2 \times 10^2$ CFU/mL, and $0.6 \times 10^2 - 1.2 \times 10^2$ CFU/mL for groundwater and sediments, respectively. The resistance bacteria percentage against CXM (16.55%), CLOX (15.82%), AMX (13.98%), AUG (12.90%), SMX (10.46%), GEN (10.22%), ERY (8.76%), AZT (6.60%), CIP (2.68%), and TET (2.19%). According to the obtained results, CXM and CLOX showed the highest resistance, indicating bacterial adaptation in both sediment and water. However, TET and CIP exhibited the lowest resistance rates, suggesting they remain effective options. Moderate resistance was observed for SMX and GEN, highlighting the need for cautious use to prevent further resistance. These findings highlight the notable presence of antibiotic-resistant bacteria in environmental samples. Moreover, the results revealed that a thorough investigation into the presence and spread of antibiotic resistance throughout the Kelani River Basin is urgently required.

Keywords: Antibiotic resistance, Antibiotic-resistant bacteria, Environmental contamination, Kelani River, Public Health

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