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Surveillance of Antibiotic Resistance in *Salmonella* Spp. and *Shigella* Spp. from the Surface and Groundwater of Kelani River Basin, Sri Lanka

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Abstract

Antibiotic Resistance (AR) among waterborne pathogens is a growing public health concern, particularly in regions with high environmental contamination. The Kelani River, a critical freshwater resource in Sri Lanka, is exposed to sewage discharge and agricultural runoff, creating conditions conducive to the persistence and dissemination of AR bacteria. This study aimed to characterize the antibiotic resistance profiles of *Salmonella* spp. and *Shigella* spp. isolated from the transition zone of the Kelani River Basin. Twenty-seven surface and groundwater samples yielded 29 bacterial isolates, which were identified using standard biochemical assays. Antibiotic susceptibility test was evaluated for four commonly used antibiotics: Tetracycline (TET), Oxytetracycline (OTC), Sulfonamide (SUF), and Sulfadiazine (SDI) at concentrations ranging from 60 to 360 µg/mL. Minimum Inhibitory Concentration (MIC) testing of 29 isolates revealed high resistance to SUF (37%) and SDI (39%) at 60 µg/mL, persisting in 40% and 60% at 360 µg/mL, respectively. In contrast, resistance to TET and OTC was lower, showing 9% and 15% at 60 µg/mL respectively, with complete susceptibility at the highest concentration (360 µg/mL). This demonstrates markedly higher resistance to Sulfonamides than to Tetracyclines. Ten multidrug-resistant (MDR) isolates were further screened for resistance genes via PCR. All MDR isolates carried the *blaTEM* gene, associated with β-lactam resistance, whereas the *tetA* and *tetM* genes were not detected. These findings indicate the presence of sulfonamide-resistant *Salmonella* spp. and *Shigella* spp. carrying the *blaTEM* gene in the Kelani River transition zone, highlighting the role of freshwater systems as reservoirs of antibiotic resistance. The study underscores the need for enhanced environmental surveillance and improved water management practices to mitigate the spread of AR and protect public health.

Keywords: Antibiotic resistance, Kelani river, Transitional zone, *Salmonella* spp., *Shigella* spp.