

## Measurements of Pharmaceuticals and Personal Care Products in Hospital Wastewater

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The existence of Pharmaceuticals and Personal Care Products (PPCPs) in the water environment is considered a global water quality issue. PPCPs may originate from industrial sources, hospitals, long-term care facilities, landfill leachate and may enter the water environment by improper wastewater discharges posing threats to ecosystems and human health. Some implications include abnormal physiological processes and reproductive impairment, increased cancer incidence, development of antibiotic-resistant bacteria, and the potential for increased toxicity of chemical mixtures. Generally, PPCPs in wastewater are not removed by conventional wastewater treatment processes. Therefore, this study aimed to identify the presence, seasonal variation and removal efficiency of five commonly used PPCPs; amoxicillin, carbamazepine, sulfamethoxazole, ibuprofen and diclofenac in hospital wastewater around Kandy. The research also assessed the potential environmental risks associated with the presence of these compounds. Composite wastewater samples were collected between 6:00 - 7:00 a.m. from five hospital influents to the sewer, and from the influent and effluent of the Kandy city wastewater treatment plant, resulting in a total of seven samples per sampling event. There were two sampling events in the rainy season and one in the dry season, providing comprehensive coverage of seasonal variations. All the samples were analyzed utilizing Solid-Phase Extraction (SPE) and High-Performance Liquid Chromatography (HPLC) methods to quantify the concentrations of selected PPCPs. Then, Hazard Quotient (HQ) values were estimated to assess environmental risk. Results showed that the presence of selected PPCPs varied significantly between hospitals and the season with the highest values of 2888 µg/L amoxicillin, 23.6 µg/L ibuprofen, 6.9 µg/L diclofenac, 41 µg/L carbamazepine and 10.1 µg/L sulfamethoxazole at wet season, while average removal efficiencies of these PPCPs at the treatment plant was 94%, 71%, 78%, 60% and 99% respectively. The HQ values for amoxicillin (19.7) and carbamazepine (152.7) indicate significant environmental risks due to their persistence and resistance to treatment, particularly during the wet season, while other parameters remained within safe limits (HQ < 1.0). This research provides valuable insights into the concentration of PPCPs in hospital effluents and their persistence in the environment, contributing to improvements in wastewater treatment practices to mitigate environmental risks posed by PPCPs.

**Keywords:** Environmental risk, hazard quotient, hospital wastewater, PPCPs

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