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Health Risks and Environmental Impact Assessment of Reject Water Quality from Reverse Osmosis Plants: A Case Study in Medawachchiya Divisional Secretariat

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Abstract

Chronic Kidney Disease of unknown aetiology (CKD-u) has surfaced as a pressing public health challenge in Sri Lanka, particularly within the North Central Province (NCP), where the incidence is highest. Despite extensive research efforts, the precise causes of CKD-u remain elusive, with previous studies indicating that the quality of drinking water may play a significant role in the disease's progression. In response to this public health crisis, both governmental and non-governmental organizations have deployed Reverse Osmosis (RO) water purification systems in regions affected by CKD-u to ensure access to safer drinking water. Medawachchiya, a locality within the NCP, stands out as the area most severely impacted by CKD-u and was the pioneer site for the introduction of RO filtration for drinking purposes. This research, conducted over five years, sought to evaluate the effectiveness of RO systems in removing contaminants from drinking water and to assess potential health risks linked to their consumption. Additionally, the study aimed to analyze the composition and concentration of reject water produced by RO systems to determine its environmental implications and compliance with the Central Environmental Authority (CEA) wastewater discharge standards. A comprehensive social survey was conducted to gather data on prevalent health issues reported by residents across 13 Grama Niladari (GN) divisions in Medawachchiya. Commonly reported symptoms included headaches, migraines, dental issues, gastritis, joint pain, fatigue, stunted growth, and increased thirst and urination. Over the five-year period, measurements of pH, Total Dissolved Solids (TDS), and temperature revealed that TDS levels in RO-filtered water were significantly lower than recommended, while pH values fell into the acidic range. Furthermore, the reject water from the RO process was found to have removed essential minerals and heavy metals, leading to elevated TDS levels in nearby wells associated with the RO facilities. These findings underscore the urgent need for further research to investigate the rising TDS levels and to establish effective regulations governing the operation of RO plants and the management of reject water discharge. The study advocates for the re-mineralization of RO-treated water and the formulation of comprehensive guidelines to mitigate health risks and environmental consequences associated with RO water purification in communities impacted by CKD-u.

Keywords: *Reverse osmosis, Chronic kidney disease, Reject water quality, Health risks*