

Nephrotoxic Effect of Environmental Water Sample on Wistar Rats with Special Reference to Synergistic Effect of Fluoride and Hardness

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Chronic Kidney Disease of unknown aetiology (CKDu) is a serious health problem in Sri Lanka and it has spread in epidemic proportions among the rural farming communities in the North Central Dry Zone of the country. There are several hypotheses on this phenomenon and the present study was focused on the nephrotoxic effect of environmental water samples on Wistar rats. Special attention was taken to evaluate the synergistic effect of water hardness and fluoride on nephrotoxicity. Experimental protocols were approved by the ethics committee of the Institute of Biology, Sri Lanka (ERCIOBSL 194062019). Fourteen Wistar rats were randomly assigned into two groups (n=7). One group of rats was treated with water sample collected from Padaviya while the other group was given de-ionized (DI) water as the control group. Body weight and daily water consumption of each rat were measured and blood and urine samples were collected at 0, 7, 14, 28, 42, 60, 90, 120 and 150 days' intervals. Serum creatinine, urine creatinine and urinary biomarker KIM-01 were analysed. The concentrations of fluoride and hardness of Padaviya water sample were 1.91 and 280 mg/L respectively. There was no significant difference in body weights and daily water consumption between treated and control groups ($p>0.05$) were recorded. Average serum creatinine levels of the rats treated with Padaviya water and DI water were ranged from 0.73 to 1.02 mg/dL and 0.56 to 0.71 mg/dL respectively. Average urine creatinine levels of the rats treated with Padaviya water and DI water were ranged from 0.61 to 0.76 mg/dL and 0.65 to 0.7 mg/dL respectively. KIM-1 level was not detected in the control group treated with DI water where rats received Padaviya water, the KIM-1 level was 5.9 ng/mL at the end of the study. The results indicate that there was a nephrotoxic effect from Padaviya water sample which recorded high fluoride and water hardness. Thus, further studies are needed to evaluate the synergistic effect of water hardness and fluoride to determine the threshold levels.

Keywords: Synergistic effect; Fluoride; Water hardness; Creatinine levels; Nephrotoxic effects