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Preliminary study on cyanobacterial diversity in water sources of CKDu endemic Girandurukotte area, Sri Lanka

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Cyanobacteria are prokaryotic photosynthetic organisms and considered as the pioneering organisms of planet Earth. Some cyanobacteria species produce toxic secondary metabolites, referred to as cyanotoxins. Among them microcystin (MC), cylindrospermopsin (CYN), anatoxin-a (ANA-a) and nodularin (NOD) have shown hepatotoxic, dermatotoxic, neurotoxic and cytotoxic effects in humans. Attention towards the cyanotoxins in the water sources of dry zone in Sri Lanka has been increased due to its potentiality for causing the Chronic Kidney Disease of unknown etiology (CKDu). This study focused on CKD and CKDu patients in a region of high CKDu prevalence, in Girandurukotte, and the presence of cyanotoxins in their drinking waters. Water samples (n = 57) were collected into sterilized brown glass bottles from wells, tube-wells, and reservoirs. The study population included nine CKD patients, 24 CKDu patients, and five healthy individuals. 50 ml of each water sample was centrifuged at 3500 rpm for 10 minutes and a mixture of 500 µl of supernatant and the pellet were inoculated into cyanobacterial specific BG11 medium and incubated at 28 °C under fluorescent light with intensity of 4.8×10^{-4} cm⁻² W - 5.9×10^{-4} cm⁻² W a 16:8 h D/L cycle for 4 weeks. Cyanobacterial growth was observed in 77% water samples. Chroococcus, Oscillatoria, Anabaena, Gloeocapsa, Raphidiopsis, and Microcystis were reported as the dominant cyanobacterial genera. Among them, Oscillatoria and Anabaena are potential MC, CYN and ANA-a producers while Microcystis species produce MC and ANA. Moreover, Raphidiopsis species are considered as potent CYN and ANA producers. Potential microcystin, cylindrospermopsin, anatoxin-a, and nodularin producing cyanobacteria were identified from 36% CKD, 68% CKDu and 15% of healthy individuals' well waters, 18% from reservoirs and 9% from other sources. According to results presence of potential cyanotoxin producers were found to be high in well waters of CKDu patients. The study is in progress to find the relationship between cyano-toxicity and CKDu disease.

Keywords: cyanobacteria, cyanotoxin, CKDu, groundwater, drinking water