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Atmospheric heavy metal analysis in Chronic Kidney Diseases of unknown aetiology (CKDu) affected areas using moss bio-monitoring

K. M. T. De Silva* and M. P. Deeyamulla

Department of Chemistry, Faculty of Science, University of Kelaniya, Sri Lanka
*thisismtd@gmail.com

Air pollution is a common issue faced by both urban and rural areas due to many factors. Heavy metals are one of the major types of air pollutants that can cause different health issues in humans including kidney diseases. Although only a handful of studies have been conducted so far to link air pollution with kidney disease, correlations have been found between atmospheric particulate matters with kidney diseases. These particulate matter are capable of absorbing heavy metals. Cr, Pb and Cd are three such heavy metals identified with a direct link towards kidney diseases. Therefore, in this study, the atmospheric levels of these three heavy metals were investigated in areas with high occurrence of Chronic Kidney Diseases. The study was carried out using moss biomonitoring as the method of atmospheric monitoring. Two variations of this method which are native moss analysis and moss bag technique were used. In native moss technique, moss samples (*Hyophila involuta*) of the selected species were collected from different locations of the study area and were analysed. In the moss bag method, nylon bags containing the selected moss species were placed in different locations of the study area, keeping undisturbed for 100 days, collected and analysed. In this study Medawachchiya was selected as the study area due to the high records of CKDu in the area. Levels of Cr, Cd and Pb in 4 different geographic locations within Medawachchiya were compared and the accumulation of heavy metal during 100 day period was analysed using moss bag technique. All the analysis was done using Flame Atomic Absorption Spectrophotometry (GBC 5000). According to the native moss analysis, highest amount of heavy metal detected was Cr (22.29 ± 3.15 $\mu g/g_{moss}$), followed by Pb (16.48 ± 1.80 $\mu g/g_{moss}$) and Cd (1.21 ± 0.06 $\mu g/g_{moss}$). According to the Native moss analysis, the highest levels of Cr, Pb and Cd were recorded at Kirigollewa Gramaniladhari division. There were no significant difference between Cd, and Pb amounts between Kirigollewa and other areas (P=0.357), but there was a significantly higher amount of Cr in this area compared to other areas (P=0.033). Considering the CKDu patient data, Kirigollewa can be recognized as a high prevalent area of the disease. Moss bag analysis revealed an increase of Pb and Cr levels during the given period but a decrease of Cd level in all areas. However, to establish a possible correlation with CKDu, more analysis is required.

Keywords: Chronic kidney disease of unknown etiology (CKDu), moss biomonitoring