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Occupational exposure levels of Glyphosate among vegetable farmers in Nuwara Eliya, Sri Lanka: A Enzyme -linked Immunosorbent Assay

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Glyphosate (GLY) is a non-selective weedicide widely used by vegetable farmers in Nuwara Eliya (NE), Sri Lanka. It has been recently declared as carcinogenic and induces nephrotoxicity in rat models. Poor weedicide handling and management are common among farmers and it may increase the risks of exposure to the weedicides. Therefore we conducted a survey to find out the herbicide usage and handling practices of vegetable farmers (n=98) in selected locations in NE. [Bullualla, (n=24); Hawa eliya, (n=37); Sandathanna, (n=37)]. The survey was conducted by using the questionnaire which contained demographic information and agro chemical survey. Based on the survey, we estimated GLY exposure among selected vegetable farmers who have been exposed more than 10 years [Sandathanne, (n=11); Bullualla, (n=5); Hawa eliya, (n=14)] and compare with non-farming population (n=20) from Matara. Early morning first urine sample was collected and GLY concentrations in urine (U-GLY) were analyzed using competitive enzyme-linked immunosorbent assay (ELISA) method using commercial kits (US Biocontract Inc., San Diego, CA, LDD-0.05 ppb). Urinary creatinine was measured using the Dimension® clinical chemistry system (Siemens Healthcare Diagnostics). U-GLY concentrations were determined by 4PL nonlinear regression model and differences of U-GLY and creatinine adjusted U-GLY among the locations were compared by IBM statistics 19. U-GLY was detected in all study groups and the highest mean concentration of U-GLY was detected in Bullualla vegetable farmers (234.67µg/g Cr, Min=175.7, Max=284.5) and lowest concentration of U-GLY was detected in Sadathanna vegetable farmers (176.54µg/g Cr, min=140.91, max= 205.38). These results are compatible with the survey results of weedicide handling and management. U-GLY concentrations in vegetable farmers were significantly higher than the non-farming control group (P< 0.05) indicating higher occupational exposure among the farmers. However GLY residues were also detected in the control group (Mean = 136.31 µg/g Cr) and such non occupational exposure warrants further studies.

Key words: Glyphosate, Nuwara Eliya, Vegetable farmers, ELISA

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