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Lung function following low-level exposure to organophosphate pesticides

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This study aimed to determine the effects of low-level exposure to organophosphate (OP) pesticides on lung function. Twenty-five farmers who regularly spray OP pesticides and 22 freshwater fishermen who are likely to be exposed to environmental spray-drift were recruited randomly from Uda Walawe. They were evaluated between and during exposure seasons to assess chronic and acute effects, respectively. Forty marine fishermen living away from agricultural areas were recruited as a control group. Forced vital capacity (FVC), forced expiratory volume in the first second (FEV1), forced mid-expiratory flow rate ($FEF_{50\%}$) and peak expiratory flow rate (PEF) were measured by 'Chest' spirometer (Tokyo, Japan). Acetylcholinesterase (AChE) levels (U/ g) were measured by a WHO-approved Testmate ChE system (Ohio, USA). Mean ages (years) of the farmers, freshwater fishermen and the controls were 37.45, 37.33 and 39.35, respectively ($p=0.431$). Farmers had been in their lifetime exposed to pesticides for a mean of 13.8 years. FVC (L) was lower in the farmers as compared to the fishermen and controls ($p\leq0.001$) between and during exposure seasons. In the farmers, FVC decreased further during the exposure season ($p=0.024$) as compared to between exposure seasons. FEV1 (L) and PEF (L/ s) were lower in the farmers as compared to the controls in both seasons ($p<0.05$). FEV1/FVC ratios were similar in the three groups between ($p=0.988$) and during ($p=0.159$) exposure seasons. AChE level (mean) between exposure seasons in the farmers (30.43) was higher ($p=0.013$) as compared to the fishermen (28.28) and controls (27.61). Following exposure to OP, AChE levels dropped 12.75% in the farmers ($p<0.001$) and 5.62% in the fishermen ($p=0.001$). Repeated exposure to OP increases AChE production resulting in high baseline values. A reduced FVC and FEV1 with a normal FEV1/FVC ratio seen in the farmers between seasons, indicates a restrictive lung dysfunction possibly due to thickening of alveolar-capillary membrane caused by slow, continuous release of OPs stored in body fat. Lower PEF values in farmers indicate obstructive airway pathology following occupational exposure to OP. A further reduction in FVC in the farmers during the exposure season indicates an increase in pulmonary secretions and pulmonary oedema. Acute and chronic low-level, occupational exposure to OP results in restrictive lung dysfunction with some degree of obstructive airway pathology, a phenomenon not observed in environmental exposure.

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