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Study of plasma cholinesterase activity in school children in two districts with high incidence of organophosphate poisoning.

C Deepal Mathew* and C A Muller
Department of Biochemistry Faculty of Medicine University of Colombo, Colombo 08

Organophosphate insecticides are the commonest cause of poisoning in Sri Lanka. Organophosphates inhibit acetylcholinesterase and plasma cholinesterase (pseudocholinesterase). Cases of organophosphate and carbamate poisoning admitted to hospitals per 10,000 population vary depending upon the district. For the year 2000 Colombo district reported a low value of 1.8 and Matale and Anuradhapura reported high values of 13.5 and 23.1 respectively. Low level chronic exposure to organophosphates, which is sufficient to lower plasma cholinesterase levels leads to impairment of vigilence, information processing and memory. Therefore school children exposed to organophosphates sufficiently to lower plasma cholinesterase activity will not perform well at examinations. Genetic variants of plasma cholinesterase can also lead to decreased enzyme activity. Genetic variants can be identified by dibucaine inhibition. Dibucaine inhibition of normal homozygotes is 75 to 85%, for heterozygous 40 to 70% and atypical homozygotes is 15 to 30%.

In Anuradhapura district 46 male and 36 female school children aged 15 to 16 years and in Matale district 51 male and 55 female students of the same age group were randomly selected for the study by cluster sampling method. By a questionnaire it was determined that in the Anuradhapura district 82.5% of males and 75% of the females have been exposed to pesticides. Considering the persons exposed to pesticides, 23% have used pesticides at home, 15% have participated in spraying of pesticides, 28% were present during the spraying of pesticides by their family members, 47% have been present when a neighbour has been spraying pesticides. In the Matale district, 72.5% of males and 49% of females have been exposed to pesticides, 55% have used pesticides at home, 13% have participated in spraying of pesticides, 37% were present during spraying of pesticides by their family members, 32% have been present when a neighbour has been spraying pesticides. In Anuradhapura district plasma cholinesterase activity for males and females were 4933 U/L ± 927 and 4646 U/L ± 726 respectively. In Matale district plasma cholinesterase activity for males and females were 5062 U/L ± 976 and 4828 U/L ± 767 respectively Plasma cholinesterase activity of 131 students exposed to pesticides was 4832 U/L +/-839. Plasma cholinesterase activity of 57 students not exposed to pesticides was 4975 U/L +/- 912. The difference observed was not statistically significant and was within the normal range (3500 – 8500 U/L). The distribution pattern of plasma cholinesterase activity determined by the normal probability plot and the "Anderson – Darling" normality test shows that normality is satisfied at a 0.001 significance level. Therefore sampling shows statistical normality. Dibucaine studies indicated above 80% inhibition for all subjects. Therefore all the students were normal homozygotes. Results indicate that although exposure to pesticides is high in districts reporting a high incidence of organophosphate poisoning, the students in 15 to 16 age group do not suffer from chronic organophosphate poisoning as measured by these tests.

* Tel: 011 2697485