



Original Research Article

Biochemical alterations among spray farmers due to chronic exposure to Chlorpyrifos, an organophosphate pesticides

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A B S T R A C T

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Chlorpyrifos is a widely used organophosphorus pesticide. A study was carried out on spray farmers to evaluate the impact of Chlorpyrifos on the biochemical parameters due to chronic exposure. Thirty occupationally exposed spray farmers and equal number of unexposed subjects were selected from Sehore district, Madhya Pradesh using stratified proportionate random sampling procedure and tested for different biochemical parameters using standard protocols known. We found out that Total Serum protein and Fasting blood sugar level were significantly decreased in the sprayers who were involved in Ops spraying for more than two years where as urea and creatinine were found to increase significantly as compared to control. Hence, it can be concluded that Chlorpyrifos, an Organophosphate exposure may lead to severe biochemical alterations.

Introduction

Water is not a commercial product but, rather Exposure to pesticides among the farmers in India and Southeast Asian countries is common due to their occupation in pesticide spraying (Jonnalagadda *et al.*, 2010). Chlorpyrifos (CPF) belongs to the class of organophosphorus pesticides (OPs), which are the most commonly used pesticides worldwide (Fayssal, 2011). Chronic non-reversing neuron behavioural effects of exposure to OPs compounds have been reported, both as an acute OPs poisoning and chronic low level exposure (Savage *et al.*, 1988; Rosenstock *et al.*, 1991;

Steenland *et al.*, 1994). The spray farmers during spraying on crops are directly exposed to pesticides while mixing, handling spray and even through contaminated soil, air, drinking water, eating foods and smoking at work places (Soomro *et al.*, 2008).

Toxicity of organophosphates causes adverse effects on different systems in the body, including hematological and biochemical changes (Kanlender *et al.*, 2005). Organophosphates induce changes characteristic of oxidative stress (Malkovics, 1995; Ranjbar *et al.*,

2002; Abdollahi *et al.*, 2004). A significantly elevated MDA (end product of lipid peroxidation) level was observed in the sprayers exposed to OPs, carbamate, and organochlorine pesticides, when compared to the controls suggesting that oxidative stress may be involved in the toxicity of pesticides (Hai *et al.*, 1997; Bachowski *et al.*, 1998; Prakasam *et al.*, 2001). Although studies are available on various harmful impacts on experimental animals, with an individual or group of pesticides, no detailed report is available on subjects who apply different categories of OPs pesticides. Thus, it is of interest to study biochemical parameters of the agricultural workers engaged in spraying the organophosphate pesticide in the Sehore district, Madhya Pradesh.

Materials and Methods

Subjects were selected on the basis of the questionnaire filled by the farmers mainly involved in farming for two to five years at Sehore district, Madhya Pradesh. The questionnaire provided information of sprayers and controls with regard to their general health status, on the basis of which they were categorized into two groups. G-0 included those who were not directly exposed to pesticides and were called control. G-1 included those who were exposed to pesticides for two to five year.

Blood samples were drawn from each of the exposed (n=30) and unexposed subjects (n=30). About 15ml (each) of blood sample from both exposed and unexposed subjects was collected in EDTA vials, which were transported to the laboratory within 4 hours using gel packs to protect its original nature. Total Serum protein was assayed using the Lowry's method(1951). Creatinine and urea level were assayed using the Jaffe method (Slot,

1965) and Fasting blood sugar level was estimated using GOD-POD method (Bergmeyer,1974).

Statistical analysis

The statistical analysis was performed using mean as a base for central tendency followed by calculation of deviation using standard error. Statistical significance was drawn by comparing the p value from the Students't' test table. Significantly different if $p < 0.01$, highly significant if $p < 0.001$.

Results and Discussion

The frequency of applications of pesticides was found to be high in farmers and they were repeatedly exposed to different types of pesticides among which organophosphate pesticides (Ops), Chlopyrifos was predominant. Studies reported earlier showed a wide variety of signs and symptoms in the farmers exposed to Ops (Misra *et al.*, 1985; Thamaz *et al.*, 2003; Rastogi *et al.*, 2009). These observations are in conformity with the present study.

Biochemical parameters are the best indicators of stress situations caused by pesticides or chemicals. During the study Total Serum protein, Creatinine, urea, Fasting blood sugar of both the case groups were estimated. It has been observed that sprayers exposed to Chlorpyrifos showed significant decrease in the Total Serum protein and Fasting blood sugar compared to control where as urea, creatinine content were increased significantly when compared to control G-0 (Table 1). Similar observations were made by the earlier workers (Attia, 2006; Azmi *et al.*, 2006; Hernandez *et al.*, 2006). The study demonstrated the detrimental

Table.1 Impact of organophosphate on biochemical parameters in spray farmers

S.No.	Biochemical parameters (mg/dl)	Group (G ₀) (N=30)	Group (G ₁) (N=30)
1.	Protein	8.58 ± 0.76	2.56 ± 0.84**
2.	Fasting blood sugar	106.57 ± 7.54	69.02 ± 10.43**
3.	Urea	21.66 ± 3.95	122 ± 5.04**
4.	Creatinine	0.65 ± 0.026	2.98 ± 0.01**

± = Standard error of mean

** = significantly different (p<0.01) from control by students 't' test.

effect of exposure to Chlorpyrifos on biochemical parameters of pesticide applicators in the Sehore district, Madhya Pradesh.

Use of pesticide is leading to health problems which may lead to severe calamity. Sincere approach towards Biopesticides must be taken to avoid the things that we can foresee due to the continuous use of chemical pesticide, although more research needs to be done on various health parameters to decide the severity of the situation.

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