

Haematological Alterations in Sprayers Occupationally Exposed to Multiple Pesticides

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Abstract: Exposure to pesticides may result in some health effects on human. We estimated the pesticide spraying effects on haematological parameters among pesticide sprayer of Kasganj Uttar Pradesh (India). 50 pesticide sprayers were compared with 26 non-occupationally exposed controls group from same area. Haematological parameters including RBC, WBC, PCV, Platelet and DLC were measured. No significant differences were found in Platelet, granulocyte and lymphocytes, whereas RBC, WBC, PCV monocytes counts were significantly more ($P < 0.05$) in pesticide sprayers compared to the control group. The finding of the study indicates that haematological parameters might be used to detect chronic effects of exposure of mixture of pesticides.

Key words: Agriculture • Pesticide Sprayers • Occupational Exposure • Human Health • Haematological Parameters

INTRODUCTION

Pesticides are widely used throughout the world in agriculture to protect food and cash crops. Pesticides are chemical substance or mixture of other substances that are used for preventing, destroying, repelling or mitigating various kinds of pests. Pesticide includes insecticides, fungicides, herbicides, molluscides etc. Increased use of pesticides intensifies health risk and its impact on humans. Mainly to occupational sprayers who are involved in pesticide spraying. Pesticides exposure to the farmers mainly occurs through the dermal contact, eyes, inhalation and ingestion [1]. In India farmers are usually not in a habit to use protective face masks [2,3]. The widespread use of many pesticides leads to the mixed exposure of pesticides to applicators, manufacturing workers, ecosystem and finally to the general human being. Occupational exposure to pesticides has been regularly associated with an increased risk of many adverse health effects on different body systems including haematological changes [4,5]. Several studies revealed that workers exposed to pesticides for prolonged periods are more likely to develop developmental and immunological effects as well as leukaemia etc. [6-8]. They usually use various kinds of pesticides viz. insecticide, fungicide and weedicide throughout the year

and get exposed. The pesticide sprayers of the study area are using pesticide like Profenfas, Diazinon, Parathion, Malathion, Endosulfan, DDT, Hexaconazole, Monozeb, Isoprotuton, Atrazine etc. [2]. The cultivate all types of crops including cash crops, wheat, rice, pulses, maize and vegetable due to availability of plenty of water as agricultural activities as the famous double Hazara canal flows in this area for irrigation.

Haematological Parameters have been considered as a good indicator and may be used to detect the hazardous effects of pesticide exposure [9]. We have conducted this study to monitor haematological parameters in pesticide sprayers in Kasganj district of Uttar Pradesh (India).

MATERIALS AND METHODS

Study Area: The study was conducted at Kanshiram Nagar district of the state Uttar Pradesh of India. In this area farmers cultivate all types of crops including wheat, cereals, maize, pulses, rice but mainly cash crops and vegetables. Population of four villages was included in study because of their round the year agricultural activities as the famous double Hazara Canal flows in this area and there is no paucity of water for irrigation. The farmers mostly cultivate three crops in a year and in every crop they spray pesticides twice or thrice hence they

spray more than six times in year (approximately sixty liter solution of different pesticides). For the better yield they usually use various kinds of pesticides viz insecticide, fungicide and weedicide throughout the year and thus get pesticide.

Sample Size: Fifty pesticide sprayers and twenty-six unexposed healthy subjects (controls) from general population of same village were selected randomly for the study.

Sample Collection: With due permission of Institutional Human Ethical Committee (IHEC), Agra College Agra and Chief Medical Officer (CMO) of district Kanshiram Nagar the study was conducted. Approximately 5 ml of venous blood was collected using anticoagulant EDTA glass vials coded for both pesticide sprayers and controls. After the collection, blood samples were transported to the laboratory in ice-cold condition on the same day immediately. They were analysed for haematological parameters such as Red blood cells (RBCs) count ($\times 10^6 \text{mm}^{-3}$), total number of white blood cells ($\times 10^3 \text{mm}^{-3}$) and their differential count, Platelet count (10^6mm^{-3}) and packed cell volume (%) were analysed by Celltac α fully automated Hematology Analyzer MEK-6410/MEK-6420 from NIHON KOHDEN, JAPAN.

Statistical Analysis: Significant differences of mean values of haematological parameters in pesticide sprayers and controls group were statistically analysed using the student's t- test online available software Graph Pad Quickcals www.graphpad.com

RESULTS AND DISCUSSION

Pesticide sprayers of the present study (resident of Kasganj) are generally exposed to different classes of pesticides viz - insecticides, fungicide and herbicides during their work. The demographic features of both groups of subjects are shown in Figure 1- 5. Age, education, occupation and marital status of the pesticides sprayers and controls were almost similar. However the result indicates that majority of male pesticide sprayers participate in the farm -field.

Demographic Characteristic of Controls and Sprayers: Haematological parameters of sprayer farmers were assessed and no significant differences were found in platelets, lymphocytes and granulocytes compared to controls (Table 1) and were in accordance with the

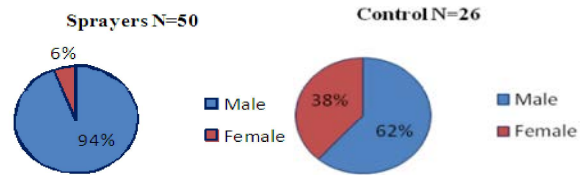


Fig. 1: Comparison of Sex between sprayer and control

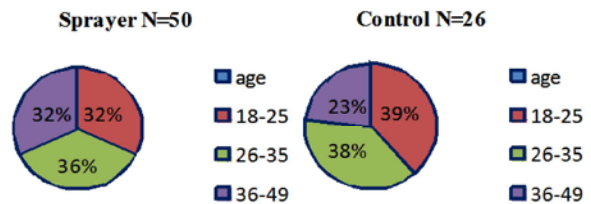


Fig. 2: Comparison of Age between sprayers and controls

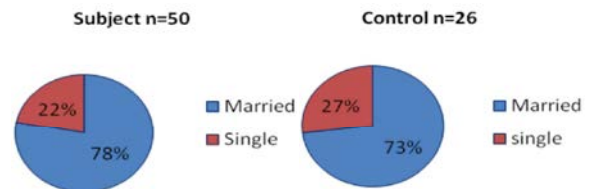


Fig. 3: Comparison of Marital Status between sprayers and controls

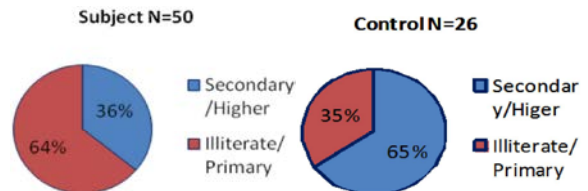


Fig. 4: Comparison of Education between sprayers and controls

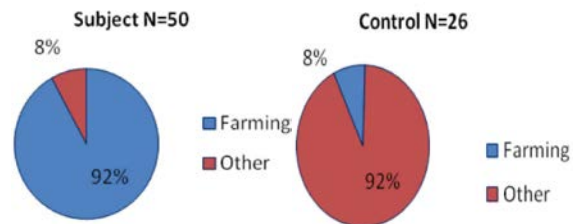


Fig. 5: Comparison of Occupations between sprayer and control

findings of Al-Sarar *et al.* [10]. However a significant increase in Red blood cells (RBCs) count, packed cell volume (PCV), white blood cells (WBCs) and monocytes was observed in the pesticide sprayer. Higher WBCs count indicates the activation of defence mechanism and immune system.

Table 1: Haematological parameters showing comparison between Sprayers and Controls

S.no.	Parameters		Range	Mean ± SE	Significance Level
1.	RBC (10 ⁶ /μL)	Treated	3.17- 6.15	4.35±0.08	P<0.05*
		Control	2.3-5.26	4.03±0.13	
2.	WBC(10 ³ /μL)	Treated	3.8-11.5	7.22 ± 0.27	P<0.05*
		Control	5-10.4	6.35 ± 0.20	
3.	PLT (10 ³ /μL)	Treated	55-318	177.5 ±7.61	P>0.05
		Control	55-322	153.73±12.48	
4.	PCV (%)	Treated	23.9- 47	39.6±0.64	P<0.01**
		Control	22.3- 46.9	36.4±0.99	
5.	GR (10 ³ /μL)	Treated	2.7-8.8	4.68 ± 0.19	P>0.05
		Control	2.6-6.0	4.21 ± 0.15	
6.	LY (10 ³ /μL)	Treated	1.0-4.1	2.21 ± 0.10	P>0.05
		Control	1.2-3.7	2.42 ± 0.13	
7.	MO (10 ³ /μL)	Treated	0.2-0.9	0.40 ± 0.02	P<0.05*
		Control	0.2-0.6	0.33± 0.02	

* Significant increase, **Highly Significant increase

The increase in WBC counts in the present study was associated with a significant increase monocytes count shown in (Table 1). Jamil *et al.* [14] have reported that WBC count was increased in agriculture workers who were exposed to pesticide.

The increased red blood cells (RBCs) count and packed cell volume (PCV) in the present study are similar to the finding of Emam *et al.* [9]. Similarly increased RBCs counts in human having high DDE concentration in the blood serum has been reported by Dunstan *et al.* [15]. Contrary to this Patil *et al.* [16] found significantly decreased packed cell volume and RBCs counts in sprayers.

CONCLUSION

The present investigation demonstrated that pesticides may significantly affect the RBC, WBC and PCV and they could be useful parameters as warning signals for identification of pesticide poisoning. Blood might be used to detect early haematological effects of exposure of the mixture of pesticide.

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