

ASSESSMENT OF BIOCHEMICAL ALTERATIONS AND ADVERSE HEALTH EFFECTS AMONG OCCUPATIONAL PESTICIDE SPRAYERS**Vivian Samuel T.^{1*}, Smilee Johncy S.² and Victor Thomas V.³**¹Professor, Department of Biochemistry, J. J. M. Medical College, Davangere, Karnataka, India.²Professor and HOD, Department of Physiology, J. J.M. Medical College, Davangere, Karnataka.³Junior Resident, Department of General Medicine, J. J. M. Medical College, Davangere, Karnataka.***Corresponding Author: Dr. Vivian Samuel T.**

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ABSTRACT

Pesticide usage in developing countries has increased to control vector-borne diseases and build food production. In India, agriculture is the main occupation, and farmers rely on chemical pesticides to support their population. Pesticides can cause adverse physiological, biological, or biochemical effects, affecting various organs. The liver and kidneys are particularly vulnerable to damage from pesticides because they help with detoxification. Despite their growing use, it is still unknown how pesticides affect farmers' health. This study aims to assess the health of farmers who use pesticides and the effects of pesticides on renal and hepatic function. This cross-sectional study involved 100 pesticide spraying farmers aged 30-50 years and 50 unexposed healthy subjects. Subjects with diabetes, hypertension, renal dysfunction, liver dysfunction, cancer, or drug use were excluded. Personal and medical histories were recorded to assess health status. Blood samples were collected for biochemical assays, including liver function tests and kidney function tests. Statistical analysis was done using SPSS version 19, with p values < 0.05 considered statistically significant. The study found normal liver and renal function parameters in both groups, with slight increases in Alkaline phosphatase and serum bilirubin. Common pesticide sprayer symptoms are headache dizziness, fatigue, muscle weakness, pain, with sleeplessness and memory problems. This study helps to assess the impact of pesticide spraying on health of farmers. The findings suggest that educating agricultural workers about pesticide usage and implementing an occupational health program could help reduce toxic hazards.

KEYWORD:- Pesticide sprayers, Chronic exposure, Hepatic functions, Renal functions.**INTRODUCTION**

During the most recent decades, there has been increment in utilization of pesticides in developing countries, so as to control vector borne diseases and to build food production.^[1] In India, since agriculture is the main occupation, farmers predominantly depend on chemical pesticides to support a huge population.^[2] Pesticide usage in developing countries is 20% of absolute pesticides utilized by the world.^[3]

Despite the fact that the impacts of acute pesticide poisoning are notable, hardly any data exist on long haul, low-dose exposure to pesticides on health.^[4] Pesticides can produce adverse physiological, biological or biochemical effects with a variety of changes at gene, molecular, cellular or tissue level.^[5]

Pesticides enter the circulatory system of the farmers through inhalation, ingestion or through skin and affect the various organs. The effects vary depending on the pesticide type, its metabolites, accumulation, dosage,

exposure route, and absorption. The health of the sprayers also affects the toxic effect.^[6]

Liver and kidneys are to a great extent recognized as significant organs engaged with detoxification of living beings, through digestion and discharge of the xenobiotics and related metabolites. So these organs are in this way particularly vulnerable to damage by xenobiotics such as pesticides.^[7] Pesticides causes inhibition of certain enzymes especially cholinesterase which alters hepatic and renal functions.^[2] Numerous studies conducted on lab animals have outlined the nephrotoxic and hepatotoxic effects of agro pesticides.^[7]

In spite of increased and frequent use of pesticides the effect of these chemicals on the health of the farmers spraying the pesticides is as yet not indistinct. So this study is undertaken to assess the effect of pesticides on the hepatic and renal function, and to survey the health status in farmers spraying the pesticides.

METHODOLOGY

This cross-sectional study was conducted after obtaining Institutional Ethical Clearance from the institution and informed consent from the subjects. 100 pesticide spraying farmers in the age group of 30-50 years were recruited, the control group consists of 50 unexposed healthy subjects of similar age group and living in the same area. Subjects with history of diabetes mellitus, Hypertension, renal dysfunction, liver dysfunction and cancer, Use of drugs that affect liver functions, Chronic alcoholics were excluded from the study. Individuals were interviewed with questionnaire covering personal history including age, sex and special habits (Tobacco, Smoking, Drugs). Detailed family and medical history including occupational history were recorded to assess the health status of the sprayers with special emphasis on duration of application of pesticides and personal protective equipment used. Health effects at the clinical level were assessed using questionnaire. 5 ml of blood

was collected from the subjects under aseptic safety measures into a vacutainer. Serum sample was separated by centrifugation at 3000rpm for 15 minutes and used for biochemical assay. Liver function tests like Aspartate Amino Transferase, Alanine Amino Transferase, Alkaline phosphatase, Total Protein Albumin, Globulin, A/G ratio, Total Bilirubin, Conjugated bilirubin, Unconjugated bilirubin were assessed. All the tests were determined using Vitros 5,1FS analyzer (Ortho-Clinical Diagnostics Inc. Raritan, NJ, USA) Kidney Function test like Serum urea and creatinine were determined using Vitros 5,1FS analyzer (Ortho-Clinical Diagnostics Inc. Raritan, NJ, USA).

Statistical analysis is done using SPSS version 19. All the values are presented as mean \pm Standard Deviation. Unpaired t test is used to compare the levels. p value < 0.05 is considered statistically significant.

RESULTS

Table 1: Liver function parameters in Controls and Pesticide sprayers.

Parameters	Controls Mean \pm SD	Pesticide sprayers Mean \pm SD	*t value	P value
Aspartate Amino Transferase U/L	23.5 \pm 12.3	26.6 \pm 14.7	1.39	> 0.05 NS
Alanine Amino Transferase U/L	27.2 \pm 13.7	28.9 \pm 12.6	1.47	> 0.05 NS
Alkaline phosphatase U/L	66.4 \pm 25.1	73.4 \pm 22.8	3.03	< 0.05 S
Total Protein g/dL	8.71 \pm 1.1	7.95 \pm 1.9	1.22	> 0.05 NS
Albumin g/dL	4.22 \pm 0.9	4.02 \pm 0.4	0.93	> 0.05 NS
Globulin g/dL	4.66 \pm 1.2	4.54 \pm 1.3	1.03	> 0.05 NS
A/G ratio	0.91 \pm 0.4	0.92 \pm 0.8	0.81	> 0.05 NS
Total Bilirubin mg/dL	0.57 \pm 0.8	0.61 \pm 0.5	1.94	0.03 S
Conjugated bilirubin mg/dL	0.11 \pm 0.2	0.11 \pm 0.4	0.53	> 0.05 NS
Unconjugated bilirubin mg/dL	0.42 \pm 0.6	0.50 \pm 0.54	1.23	> 0.05 NS

*Unpaired t test

p > 0.05: Not Significant (NS); p < 0.05: Significant (S); p < 0.001: Highly Significant (HS);

Table 2: Kidney function parameters in Controls and PESTICIDE sprayers.

Parameters	Controls Mean \pm SD	Pesticide sprayers Mean \pm SD	*t value	P value
Urea mg/dL	19.12 \pm 7.06	22.43 \pm 6.84	1.09	> 0.05 NS
Creatinine mg/dL	0.78 \pm 0.23	0.91 \pm 0.24	1.38	> 0.05 NS

*Unpaired t test

p > 0.05: Not Significant (NS); p < 0.05: Significant (S); p < 0.001: Highly Significant (HS);

Tables 1 and 2 display the serum biochemical parameters of the control subjects and pesticide sprayers. All the parameters of liver function and renal function are within the normal limits in both groups. But slight increase in

the values were observed in almost all the parameters but not statistically significant except for Alkaline phosphatase and serum bilirubin which are significant.

Table 3: Self reported health complaints of pesticide sprayers.

Complaints	Percentage
Headache	58 %
Dizziness	66 %
Cough	46%
Skin itch/ redness	43%
Fatigue	51%
Muscle pain/ weakness	48%
Burning/itch -eyes	31%

Blurred vision	28%
Sleeplessness	35%
Difficulty in breathing	29%
Memory problem	24%

The symptoms of pesticide sprayers that are frequently reported are shown in Table 3. The most common symptoms are headache and dizziness, along with other symptoms like fatigue, muscle weakness or pain, burning eyes, blurred vision, skin redness or itching, difficulty breathing, insomnia, memory problems, etc.

DISCUSSION

A study conducted in occupational sprayers showed, increased C reactive protein, slight reduction in the haematological parameters, altered liver function enzymes parameters, increased blood glucose and blood urea levels.^[2]

A study conducted in pesticide sprayers in the most-planted area of Samut Songkhram showed lipid profiles between the control and study groups were statistically significantly different, and the means of lipid profiles in the pesticide sprayer group indicated a pattern towards higher danger of cardiovascular ailments than the control group. The Mean corpuscular hemoglobin concentration estimations of the pesticide sprayers and the controls were lower than the reference range. The liver function parameters and renal function parameters between the two groups were likewise not factually unique and were nearly inside the reference range. This study showed a contradicting finding from the other studies which has to be assessed further.^[8]

A study conducted in in occupationally exposed pesticide sprayers of grape gardens showed increased liver function marker enzymes-serum aspartate transaminase, alanine transaminase, alkaline phosphatase, serum bilirubin, creatinine, blood glucose, and urea and decreased acetyl cholinesterase activity and serum cholesterol.^[9]

Skin rash, eye irritation, and face burn were among the acute health symptoms associated with pesticide use that were found in a study to evaluate the effects of agrochemical pesticide use at work on Cameroonian farmers' health. Overall, the farmers' alanine aminotransferase activity was higher than that of the reference population. Other parameters that were examined, however, did not show any discernible changes. According to these findings, farmers who are exposed to agro pesticides frequently develop eye and skin disorders. Pesticides changed the function of the liver.^[10]

A epidemiological study investigated the relationship between occupational pesticide exposures and different adverse health outcomes and found that study group during the period of high pesticide exposure showed a higher chance of skin and eye symptoms compared to

controls. Assessment of hematological parameters revealed increased Red blood cell count, White blood cell count, platelets counts and hemoglobin in pesticide exposures group relative to controls. Changes in clinical chemistry parameters included decreased levels of glucose, creatinine, total cholesterol, triglyceride and alkaline phosphatase in greenhouse workers relative to controls.^[11]

A study done to evaluate the adverse health effects of pesticides on occupationally exposed workers showed a significant increase in WBC count in sprayers, slight increase in the liver and kidney function in the expose group.^[12]

A study revealed that white blood cell count was significantly decreased; uric acid and Malondialdehyde level were significantly increased in grape garden pesticide sprayers indicating oxidative stress in them. Renal and liver parameters showed a significant change.^[13]

This study aids in evaluating how farmers' health is affected by pesticide spraying. To create awareness among pesticide spraying farmers to properly handle the pesticides using personal protective equipments (PPE) such as nose mask, gloves etc. and for the need for regular medical examinations in order to identify affected workers at the earliest to reduce morbidity and thereby institute preventive measures. The necessity of official government regulation and involvement to create awareness among the occupational pesticide sprayers to plan for preventive measures. Such preventive measures will boost the health condition of the concerned people. The ACE level might be used to detect early hepatic and renal changes and haematological parameters before having adverse clinical health effects.

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