

Impact of Pesticide Use on the Health of Farmers: a Case Study in Bankura, W.B., India

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ABSTRACT: Pesticides helps in reducing the crop loss and results in better yield. However their unbridled use in agricultural sector, poses serious environmental problems. It is also intimately associated with both direct and indirect health hazards of agricultural workers. This study is aimed to determine the extent of pesticide use and to find out the associated health hazards among the sprayers, who are exposed directly. Several signs and symptoms of diseases and disorders were seen among the sprayers. The sprayers were found to be associated with higher relative risk compared to non-sprayers ($RR \geq 1.5$). Lack of adoption of protective measures was also noticed among the farmers.

KEYWORDS: Pesticides, Health hazards, Relative risk, Agriculture.

I. INTRODUCTION

India is an agriculture based country, where a vast majority of population is engaged in agriculture. Pesticides are applied with the aim of increasing productivity. Pesticide has become indispensable in agricultural production [1]. About one-third of the agricultural products are produced by using pesticides [2]. Without their application the loss of fruits, vegetables and cereals from pest injury would reach 78%, 54% and 32% respectively [3]. Use of pesticides reduces the crop loss from pests to about 35% to 42%[4, 5].

Exposure to pesticides both occupationally and environmentally results in serious health hazards. In addition inappropriate and excessive pesticide use and application, lack of proper storage and adopting inadequate protective measures frequently results in harmful health hazards and causes tremendous harm to the environment. Most of the pesticides are not easily degradable and hence linger in soils, leach to the ground water and consequently enters the food chain and affect the human health indirectly. There is both direct and indirect relationship between exposure of pesticide use and several illness signs [6]. The health effects of pesticide use have been a long controversial topic worldwide and have recognized as a serious public health concern during the past decades. In 1962, Rachel Carson, first mentioned the sudden death of birds caused by indiscriminate spraying of pesticides (DDT) in her book "Silent Spring". The farmers are now totally addicted to these chemicals and their indiscriminately and excessive use in agriculture has led to serious health implications [7]. Most of these chemicals are mutagenic and linked to the development of cancer, birth defects, chromosomal aberration^{etc}[8,9,10,11]. According to the World Health Organization estimates that there are three million severe acute poisoning worldwide each year and out of this, approximately 2,20,000 deaths are attributable to pesticides, out of which, 1% of these deaths occur only in the industrialized countries [12]. WHO has classified the pesticides into extremely hazardous (Ia), highly hazardous (Ib), moderately hazardous (II), slightly hazardous (III), and unlikely to present acute hazard (U) based on the LD50 (Table 1). The CIB (Central Insecticides Board) and RC (Registration Committee) scrutinize and reviews all pesticides and their usage. Some of the pesticides are banned and some are only meant for restricted use as regulated by CIB. Pesticide exposure has both long term chronic and short term acute effects as studied by many researchers [13,14,15,16]. However there are very few studies based on the farmers self-reported symptoms of pesticides health hazards. Therefore the present study is conducted to understand the agricultural practices of farmers relating to pesticide use and its impact on the health of farmers.

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Table.1. WHO classification of pesticides

| WHO Class | | LD50 for the rat (mg/kg body weight) | |
|-----------|----------------------------------|--------------------------------------|----------------|
| | | Oral | Dermal |
| Ia | Extremely hazardous | < 5 | < 50 |
| Ib | Highly hazardous | 5–50 | 50–200 |
| II | Moderately hazardous | 50–2000 | 200–2000 |
| III | Slightly hazardous | Over 2000 | Over 2000 |
| U | Unlikely to present acute hazard | 5000 or higher | 5000 or higher |

II. METHODOLOGY

Study area: The study is carried out among the agricultural communities of Bankura district of West Bengal. There are six blocks in Bishnupur subdivision out of which two blocks namely Patrasayer (23.216 °N, 87.516°E) & Indus (23.15°N, 87.616 °E) of Bishnupur subdivision, were purposely selected for the study (Fig. 1).



Fig. 1. Study area location

Data Collection: This study is based on the primary data. The primary data was collected from the farmers through a personal interview for the agricultural year 2015-2016. Data were collected by interview was done based on a well prepared questionnaire to find out the details of the time duration, type and nature of pesticides, exposure, precautions taken, signs and symptoms of illness, medical history along with the detailed demographic distribution.

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A total of 420 farmers were interviewed. All of them are found to be engaged in the application of pesticides and hence are directly exposed.

Relative Risk: The relative risk is the probability that a member of an exposed group will develop a disease relative to the unexposed group.

$$RR = \frac{\% \text{ (exposed group)}}{\% \text{ (unexposed group)}}$$

III. RESULTS AND DISCUSSIONS

The farmers surveyed in this study area found to have educational qualification mostly below matric (52.5%), while the percentage of farmers qualifying secondary and higher secondary levels are found to be 22.5% and 12.5%, graduates are found to be very less in number (5%), and around 3% farmers are found to be illiterate. Maximum farmers are found to take advice and consultations from quacks (75%), about 20% farmer's consults doctors and the remaining follows Ojhas (Table 2).

Table.2. Characteristics of the Sample Population

A. Age of Respondents

| Age Group | Percentage of farmers |
|-----------|-----------------------|
| < 29 | 4.9 |
| 30-39 | 32.5 |
| 40-49 | 30 |
| >50 | 32.6 |

B. Educational level of Respondents

| Level of Education | Percentage of farmers |
|---------------------|-----------------------|
| No Formal Education | 3.1 |
| Primary | 44 |
| Below Secondary | 52.5 |
| Secondary | 22.5 |
| Higher Secondary | 12.5 |
| Graduate | 5 |

C. Consultation with Physicians

| Consultation | Percentage of farmers |
|--------------|-----------------------|
| M.B.B.S | 20 |
| Quack | 75 |
| Ojhas | 5 |

Regarding storage of pesticides most widely used storage is the cowshed while some also stores pesticides in the kitchen also (Table 3).

Table 3.Storage of Pesticides

| Type of Storage | Percentage of farmers |
|-----------------|-----------------------|
| Cow shed | 55 |
| Store Room | 42.5 |
| Kitchen | 2.5 |

The present study reveals that the farmer uses a variety of pesticide under different trade names belonging to different chemical groups. Many of the pesticides fall under the highly hazardous category of WHO. The most commonly uses pesticides in the study area is listed in Table 4. Some carcinogenic pesticides are also found to be used by the farmers.

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Table 4. Commonly used pesticides by the Farmers

| Common Name | WHO classification | % of Farmers |
|----------------|----------------------|--------------|
| Chloropyrifos | Highly Hazardous | 12 |
| Cypermethrin | Highly Hazardous | 70 |
| Carbofuran | Highly Hazardous | 72 |
| Endosulfan | Highly Hazardous | 64 |
| Carbosulfan | Highly Hazardous | 46 |
| Hexazinone | Moderately hazardous | 68 |
| Isoprothiolane | Moderately hazardous | 59 |
| Trycylazole | Moderately hazardous | 8 |
| Propicnazole | Moderately hazardous | 10 |
| Melathion | Slightly Hazardous | 40 |

Handling and application of pesticides requires the use of appropriate protective measures and equipment's, which includes use of gloves, masks, aprons etc. it was observed that most of the farmers in the study area uses masks and aprons, no other protective measure is found to be used by the farmers. The farmers are seen to mix the pesticides with bare hands. A great many farmers inform smoking during pesticides application, many were seen chewing tobacco.

Table 5. Carcinogenic Pesticides used by the Farmers

| Carcinogenic pesticides | Percentage of Farmers |
|-------------------------|-----------------------|
| Acephate- C | 35 |
| Cypermethrin-C | 70 |
| Propiconazole -C | 10 |

The health effect of pesticide application on the farmers is analysed through the questionnaire. They were asked whether they were facing any symptoms and problems during or immediately after the application of pesticides. Several health hazards are reported by the farmers. Most of them said that they were facing headache (34.19%) while many reported several skin diseases (30.97%).

Table 6. Effect of Pesticide on users Health of Farmers

| Disorders | Sprayers | Percentage | Non Sprayers | Percentage | Relative Risk (R.R) |
|--------------------------------|----------|------------|--------------|------------|---------------------|
| Burning/Stinging/ Itching eyes | 96 | 30.97 | 16 | 14.55 | 2.13 |
| Cough | 79 | 25.48 | 12 | 10.91 | 2.34 |
| Headache | 106 | 34.19 | 24 | 21.82 | 1.57 |
| Muscle Cramps | 10 | 3.23 | 4 | 3.64 | 0.89 |
| Nausea/Vomiting | 35 | 11.29 | 19 | 17.27 | 0.65 |
| Nervousness | 7 | 2.26 | 4 | 3.63 | 0.62 |
| Respiratory Problems | 15 | 4.84 | 2 | 1.81 | 2.67 |
| Skin Disease | 96 | 30.97 | 20 | 18.18 | 1.70 |

Nausea and respiratory problems are also reported while some are found to have muscle cramps. The relative risk is calculated to determine the probability of determining the risk among the sprayers compared to non-sprayers. It is important to note that a higher frequency of health disorders was seen among the sprayers. Among the farmers higher relative risk was observed in headache, skin diseases, respiratory problems, cough, burning/stinging/ itching sensation of eyes ($RR = \geq 1.5$).

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IV. CONCLUSION

The results reveal that the farmers in the study area are affected with different types of problems due to pesticide exposure. Higher relative risk was found among sprayers compared to the non-sprayers. In general they are not much aware of pesticide toxicity and protective measures which should be taken before, after and while application of pesticides. Many associated chronic and acute health hazards are reported in farmers. Since the prevalence of this disease is computed from the self-reported symptoms there could be some underestimation of these numbers. Awareness must be created among the farmers on the use of personal protective measures, while pesticide application. It can be the governmental and non-governmental authorities need to take pragmatic initiatives for implementations of rules and regulations of pesticide use. The need of the hour is to enforce and ensure the use of IPM and using protective gear while handling pesticides. Some training programmes should also be arranged for creating knowledge regarding potential negative impacts of pesticides. Benefits of using bio pesticides should be widespread among the farmers and bio pesticides should be made easily available among the farmers

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