



**ROLE OF PHARMACIST IN CREATING AWARENESS ON EXPOSURE OF
ORGANOPHOSPHORUS PESTISIDE AMONG AGRICULTURE WORKERS –
TAMIL NADU**

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ABSTRACT:

Agriculture workers are at higher risk of exposure to organophosphorus (OPs) pesticides. In this regard, farmers are at high risk as they are highly and more frequently exposed to OPs without knowing the handling OPs safely. Creating awareness about the hazards of exposure to OPs can result in a drastic reduction in morbidity and mortality rate. This is an educational interventional study carried out for six months among agriculture workers and farmers of selected villages across the state of Tamil Nadu in southern India. All the participants were administered with pre and post-tests using a structured questionnaire. After the pre-test educational session was conducted using informational leaflets, and audiovisuals. Post-test was conducted after 2 weeks of Pre-test. Overall awareness among the agriculture workers and farmers about OPs in terms of knowledge, safety-handling, and first aid was found inadequate during the pretest but was significantly improved after the educational sessions during the post-test which revealed and emphasized the role of the pharmacist in public health education.

KEYWORDS: Organophosphorus Pesticides; Knowledge; Pharmacists; Educational Interventional Study; Questionnaire; India

INTRODUCTION:

Poisoning from synthetic organic compounds containing phosphorus, particularly pesticides that work by inhibiting cholinesterase, is known as organophosphorus (OP) chemical poisoning and is a significant public health issue globally^[1]. OP pesticides are used to kill a variety of insects, primarily on farms where they are employed on food crops. More than 80 different OP compounds have been synthesized and in the developing countries like India there are no rules and regulations governing the purchase of OP compounds and such highly toxic substances are easily accessible^[2]. Malathion, paraoxon, chlorpyrifos, and soman are among the most well-known OP pesticides. Exposure to OP pesticides happens through the mouth upon coming into contact with surfaces contaminated with insecticides, less frequent exposures through inhaling or skin absorption. By consuming foods & crops that have been treated with these OP pesticides, people are exposed to organophosphorus pesticides. More exposure than the general public may occur for farm workers, gardeners, florists, pesticide applicators, and manufacturers of certain insecticides. Those who are suddenly exposed to high concentrations of OP pesticides may experience health issues such as nausea, vomiting, an irregular heartbeat, breathing difficulties or chest tightness, salivation, and seizures. Those who are exposed to organophosphorus pesticides for a longer period may experience fatigue or weakness, irritability, depression, or forgetfulness.^{[3][4]} Among 25 million agricultural laborers in developing countries, at least one of OP poisoning occurs per year^[5]. The purpose of this educational interventional study is to assess the knowledge of rural agricultural workers and farmers about OP pesticides, their occupational hazards and educated them to avoid such hazards in the future.

MATERIALS AND METHODS:

The study recruited the adult farmers and agricultural workers after getting the informed consent, from different villages of the state of Tamil Nadu situated in south India. The demographic details of the study participants and their level of exposure to OP pesticides were collected using a structured data collection form as part of the study questionnaire. The socio-economic status of the study participants were determined based on the modified Kuppusamy scale^[18]. The questionnaire for assessing the knowledge of the study participants regarding the OP pesticides, their hazards, safe handling, etc. was administered to the groups of participants at villages. These data were treated as pre-education data. Then, the same groups of participants were given education about proper handling & storage of OP pesticides, signs & symptoms, and first aid measures for OP poisoning by using the

educational materials such as pamphlets and audio-visuals in the local language Tamil, and the participants were given clarifications for whatever the doubts raised by the participants. Then, after two weeks of time, the same questionnaire was administered to the study participants who completed the pre-education questionnaire and these data are treated as post-education questionnaire. SPSS software (v21.0) was used for data coding, validation, data selection, and conventional statistical analysis such as descriptive and inferential statistics. The paired student's t-test was also used and statistical significance is considered when the p value is less than 0.05.

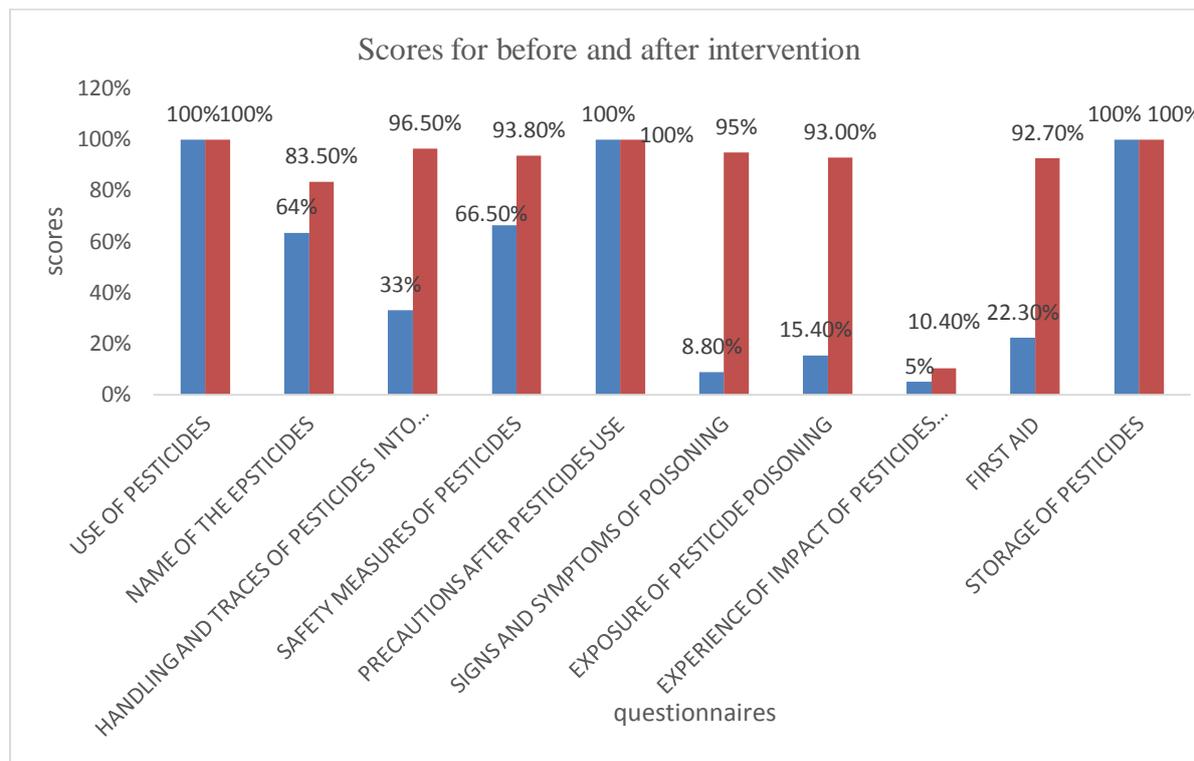
RESULTS AND DISCUSSION

The farmers who participated in this program were aged from 18 to 75 years (mean \pm SD). Out of 260 participants recruited into the study, 132 (55 %) were male and 128 (45 %) were female who were found to be either farmers or farm laborers. According to the modified Kuppaswamy scale, the majority of people (n=; 58%) in this study belonged to the lower middle class, earning between 750 and 999 INR per day, while the rest (n=; 42%) belong to the lower class, earning between 500 and 750 INR per day. The demographic details and the number of subjects recruited from each district is shown in Table-1. The total scores secured by the participants during pre and post educational period, their percentage and the difference in the score are shown in Table-2. Positive changes were observed in the scores of individual categories viz. knowledge, safety handling and first aid. However, the scores were found to be maximum in the storage domain that denoted the participants are completely aware about the proper storage of OP pesticides.

There is statistical significance between all knowledge, Safety and Handling, first aid, and storage queries. With the aid of the raw data, four distinct parameters based on the questionnaire were categorized, and mean values and standard deviations were computed for both before and after education. The paired t test was performed using the mean values and standard deviation, and the p values are given in the preceding table 3, which appears to demonstrate the significance.

The pre and post education scores on individual domains of the questionnaire is shown in Figure-1. It is very much evident that except in the domains use of pesticides and storage questions, in all other domains, the post education scores have been enhanced significantly (p<0.05).

Figure-1



Knowledge on the OP Pesticides: Organophosphorus pesticides are highly toxic compounds that are also the most commonly used one among all agrochemicals. A set of five questions were posed to the participants to assess their knowledge on the signs and symptoms of OP poisoning, as well as their complications. Before the education, the percentage of respondents had the knowledge was about 46 (n=260) and after the intensive education, about 97% (n=260) of the respondents showed a good knowledge about OP pesticides and their hazards.

Safety Measures & Handling of OP Pesticides: The questions on whether people wear protective equipments (masks, shoes, gloves, etc.) and mix the insecticide with proper diluent in proper proportions were asked. Also, questions on how farmers use the pesticide in their agricultural fields, such as spraying on crops were asked. The results showed that about 83 % (n=260) of respondents were aware of safe handling of OP pesticides. Following the

educational intervention, the results showed that about 97% (n=260) of the respondents gained knowledge about pesticide safety and its handling.

Storage of Pesticides: Proper storage of OP pesticides is a mandatory to ensure the safety and avoiding accidental poisoning. In this study, the participants were well known about this process and hence, at the pre-education period itself the maximum scores were scored and obviously post education scores also at cent percent.

First-aid for the OP Poisoning: During the pre education period, majority of the subjects (n=; 23 %) did not know about the first aid to be given during accidental or intentional poisoning. Following the educational intervention, the subjects were asked the same questions, which resulted in approximately 93 % (n=260) knowledge about first aid procedures.

DISCUSSION

Intervention studies using educational programs about OP pesticides to the farmers and agricultural workers to enhance the knowledge and awareness about the OP pesticides, their exposure and first-aid measures are very much encouraged in the literature^{[10][11]}. OP poisoning was higher among illiterate, where the findings indicated most of the farmers were not aware of the precautionary methods like wearing adequate protective devices required to protect themselves from the OP poisoning. The safe practices of using protective devices have been taught to the agricultural workers.

A study done by Lekei et al^[11] reported the knowledge on routes of absorption of OP pesticides included mainly dermal (75.2%) and inhalational (72.7%). About 10% indicated a lack of knowledge of any route of absorption. A research was conducted by Lucio G. Costa et al. (2017) to determine the Organophosphorus compounds at 80s ^[12]. In a study by Mara Teresa Munoz-Quezada et al. ^[13] (2016) on agricultural labourers' neuropsychological functioning and chronic exposure to organophosphate (OP) pesticides, Overall, evidence points to a connection between long-term work exposure to OP pesticides and neuropsychological effects, according to the study's findings. No consensus exists regarding the particular cognitive abilities that are impacted. A research was conducted by Dyah Aryani Perwitasari et al. (2017) to determine the effects of op exposure on farming'people's health ^[14]. According to the research, government health programmes should prioritise health promotion and education about the toxicities caused by organophosphate exposure. The study

was concluded by The body health and quality of life of farmers may be impacted by organophosphate exposure. Several New and Old Problems The study came to the conclusion that the toxicology of OPs will continue to be a significant problem in science and public health for years to come. Another study reported by Mohanty et al.^[15] stated that about two-thirds of the farmers in a study in South India (Puducherry) were found that safe disposal of empty containers of OP pesticide and were not aware of such safe disposal. Munoz-Quezada et al.^[16] reported that nearly 63% of farmers did not know about wearing equipment during fieldwork. Meenambigai et al.^[17] done a study in Tamil Nadu and reported that most of the farmers nearly around 93 % did not follow any of the safety measures while performing the the spraying of OP pesticides. These results are in agreement with the finding of Devi who revealed that only a few farm workers used protective clothing while spraying.

CONCLUSION

Agrochemical poisoning in general and OP poisoning in particular is a medical emergency and it is also important that it can result in high morbidity and or mortality. Hence, the potential victims, i.e., the farmers and agricultural workers should be educated and sensitized about the types, safe handling, hazards, first-aid and storage of such harmful agrochemicals. These goals can be achieved by the effective educational programs in the community.

In the present work, a significant outcome was found upon the educational program conducted by the pharmacists among the villagers in the community and that was well pronounced in all the data of pre-intervention and post-intervention scores. Hence, hereby it is concluded that educational programs must be conducted for the vulnerable people in the community to emphasize and re-emphasize the importance of risk factors, prevention of poisoning, first aid measure, and precautions.

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Conflict of Interest The authors declare that they have no conflict of interest

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| Sl. No | Age Group | Sex | | Level of Education | | Places | | | | | Marital Status | | Economic Status | | Type of Family | |
|--------|--------------|------|--------|--------------------|-------------|--------|------------|---------|-------|--------------|----------------|-----------|-----------------|--------------------|----------------|--------------|
| | Age Category | Male | Female | Educated | Un-educated | Salem | Dharmapuri | Namakal | Karur | The Nilgiris | Married | Unmarried | Lower class | Upper Middle class | Nuclear family | Joint Family |
| 1. | 18-24 | 2 | - | 2 | - | 1 | 1 | - | 2 | 4 | - | 2 | | 2 | 20 | - |
| 2. | 25-34 | 3 | 2 | 4 | 1 | 2 | 2 | 5 | 3 | 1 | 2 | 3 | 1 | 4 | 5 | - |
| 3. | 35-44 | 19 | 40 | 35 | 27 | 31 | 5 | 2 | 3 | 18 | 58 | - | 34 | 25 | 55 | - |
| 4. | 45-54 | 50 | 53 | 47 | 56 | 30 | 20 | 15 | 25 | 4 | 103 | - | 70 | 33 | 94 | - |
| 5. | 55-64 | 39 | 18 | 23 | 34 | 15 | 15 | 10 | 8 | 5 | 57 | - | 36 | 20 | 56 | - |
| 6. | 65-75 | 19 | 15 | 21 | 10 | 12 | 8 | 2 | 11 | - | 35 | - | 12 | 23 | 30 | - |
| | Total | 132 | 128 | 136 | 124 | 91 | 51 | 34 | 52 | 32 | 255 | 5 | 108 | 152 | 260 | - |

Table-1: Demographic Data

| S. No. | Parameters | n | Total No. of Points Scored among the Individuals | | % Difference | | Total % of Difference |
|--------|---------------------|-----|--|-------------------|------------------|-------------------|-----------------------|
| | | | Pre-intervention | Post-intervention | Pre-intervention | Post-intervention | |
| 1 | Knowledge | 260 | 254 | 457 | 45.88 % | 96.68 % | +50.8 % |
| 2 | Safety and handling | 260 | 428 | 504 | 83.25 % | 96.90 % | +13.65 % |
| 3 | First aid | 260 | 136 | 482 | 23.30 % | 92.7 % | +69.4 % |
| 4 | Storage | 260 | 520 | 520 | 100 % | 100 % | - |

Table-2: Assessment of knowledge before and after intervention

| Variables | Mean ± SD | | P value |
|---------------------|------------------|-----------------|----------|
| | Before education | After education | |
| Knowledge questions | 0.98±0.30 | 1.76±0.18 | <0.0001 |
| Safety and handling | 1.65±0.47 | 1.94±0.24 | <0.0001 |
| First aid | 1.22±0.41 | 1.84±0.52 | < 0.0001 |
| Storage | 2.0±0.00 | 2.0±0.00 | <0.0001 |

Table-3: p value of categorised questions of the study.