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**AWARENESS OF FARMERS ABOUT PESTICIDE HEALTH EFFECTS: A STUDY IN DISTRICT SARGODHA, PUNJAB, PAKISTAN**

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**ABSTRACT**

**Background** Pesticides have been an inevitable part of agricultural production systems all over the world. These chemicals are used compulsorily to save the agricultural products from different kinds of pests such as insects, disease and other non-suited elements. However, apart from their ill- and non-target effects on the environment, these pesticides are also prone to be deleterious and harmful to human health. Unfortunately, most of farmers and pesticide handlers are unaware of the ill effects of these chemicals and situation is worse in developing countries like Pakistan. This study was conducted in Sargodha district to assess the awareness of local farming community about pesticides' non-target effects on their health and their perception about the possible adoption of precautionary measures.

**Methodology** Through carefully structured questionnaires, one hundred and twenty respondents directly or indirectly associated with pesticide practices were interviewed in four selected locations (i.e. tehsil Sargodha, Sahiwal, Sillanwali and Shahpur) in district Sargodha, Punjab, Pakistan. Samples were drawn by using the simple random sampling method of without replacement.

**Results** Results revealed that majority of the farmers were used to exhibit carelessness and had habits of placing pesticide products (containers and utensils) at their farms haphazardly. They did not pay attention to precautionary measures for their own safety while spraying or visiting the fields under sprayed conditions.

**Conclusion** Although, many farmers had reported of mild ill effects of pesticide exposure on their routine health. However, most of the respondents had not experienced any severe exposure and health problem. It was the reason that they dealt with these harmful agro-chemicals carelessly. Nevertheless, there is a dire need to edify the farming community about pesticide health hazards.

**INTRODUCTION**

Pesticides are being widely used in agricultural system as an integral and inevitable element of pest management strategies, particularly in developing countries. Although, there are a lot of benefits for mankind associated with the use of pesticides in agriculture but these pesticides also have long lasting and undesirable effects on the environment. Jeyaratnam (1990) and Edwards (2013) comprehensively described that no doubt these chemicals help the farmers to reduce pest incidence on their crops and ensure the maximum crop production.

However, these pesticides are highly hazardous to environment and non-target organisms including human beings (Dey et al. 2013; Hu et al. 2015). These hazardous agro-chemicals can come in contact with human beings directly or indirectly by different ways such as through inhalation, ingestion, eyes and dermal contact. Pesticides act by intervening with metabolic process in the organisms to which they are subjected because of their synthetic organic nature (Hernandez et al. 2013). These chemicals are injurious to humans causing different health problems ranging from mild skin itching to skin cancers and tumors to birth defects (Kesavachandran et al. 2009; Hallenbeck and

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Cunningham-Burns 2012).

All over the world, pesticides include about 21% of the fungicides, 30% of the herbicides and 44% of the insecticides (Mathur et al. 2005), and more than 83% of all different types of pesticides, including insecticides and herbicides, are used in agriculture sector in the developing countries such as India, Pakistan, Bangladesh etc. (Satoka et al. 1997). Pesticides have become an important and unpreventable part of our agricultural system which cannot be avoided in spite of their many chronic side effects (Tariq et al. 2007).

Pesticides side effects, particularly health problems, are more conspicuous in developing countries than the developed ones (Murphy et al. 2000; Eddleston et al. 2002). One of the major reasons for more damaging effects of pesticides in developing countries including Pakistan is the lack of proper awareness and training of farming community which is directly or indirectly associated with the usage of these chemicals (Galvin et al. 2016). Tariq et al. (2004) reported that due to low literacy rate and inadequate awareness about the safe use of pesticides, there are more chances of misuse and mishandling of pesticides in Pakistan. Although, the brochures and labels of most of the pesticide products in the indigenous markets are printed in Urdu and English languages, however, more than 70% of the farmers do not understand or even cannot read the national language (i.e. Urdu). According to a report of Punjab Private Sector Groundwater Development Project (2002), there are about 47 studies regarding pesticide residues in soil, crops, water and human bodies during last 40 years in Pakistan. However, except Punjab Private Ground Water Study (PPGWS) in just one province, no other national program on pesticide monitoring has been carried out yet in the country. Therefore, it is evident that there is a dire need to assess the situation of prevailing awareness and perception of our farming community about pesticides environmental aspects and health hazards associated with the use of these toxic agro-chemicals.

To this end, a survey based study was conducted in different locations of district Sargodha, Punjab, Pakistan with aim to assess various environmental aspects of pesticides use in agricultural system and farmers' perception about the adverse effects of pesticides on their health and possible precautionary measures which they are taking into consideration.

## **MATERIALS AND METHODS**

The study was carried out in four different locations of the district Sargodha (viz; tehsils Sargodha, Sahiwal, Sillanwali and Shahpur) which were selected in view of their considerable population size and diversified

agricultural produce. A total of 120 respondents were selected on random basis with 30 respondents from each location. Samples were drawn by using the simple random sampling method of without replacement. This sampling technique was followed because it was free of any possible classification errors and required minimum advanced knowledge of the sample population, and at the end, could easily interpret the data (Waksberg et al. 1978; Levy and Lemeshow 2013). Respondents of the study have had one common characteristic that in one way or the other, they all came in contact with pesticides and were further grouped into two types. Type one of respondents were those who used to spray their crops by themselves, and the other who usually hired labor for spraying pesticides on their crops but often visited their fields post spray. Data were collected with the help of a carefully structured questionnaire. Some dichotomous and scale-based questions were the part of this questionnaire. Data were analyzed using computer software IBM® SPSS® Statistics. Frequency percentage was calculated for the first two sections of demographic and the section of preference regarding storage and application of pesticide products. Following the descriptive statistics, mean and standard deviation were drawn for both sections, one of precautionary measures and other for effect of pesticides.

## **RESULTS AND DISCUSSION**

Keeping in view the two types of respondents, we have tabulated the sampled population into different sort of categories, for instance, description of different age groups of the respondents (Table 1). Most of the farmers had an age lower than forty years which indicated that to some extent our youth is involved in the farming activities including plant protection practices. This is a positive trend. Youth can have positive and progressive role in the development of a country (Reid 1989). Idrees (2003) stated that two-third population of Pakistan is living in rural areas with most of its part engaged in farming. In rural population, one-fourth of the population is consisted of youth. Young people can be turned into productive, active and responsible members of the society, so that they can make their potential contribution towards national development. As for land and agrarian reforms, youth can be subjected as important structure in agriculture sector of economy (Hoggart and Buller 2015); diversion of the interest of youth can move the society forward towards the long way promotion of this sector.

Land is the precious asset for farmers, especially for those who have small to medium size holdings. In our study, we had a major proportion of respondents having land-holdings less than twenty acres (Table 2).

Progressive farmers can escape from direct exposure to pesticides by using their resources such as machinery, labor etc. However, small land-holders must have to take care of all farm activities by themselves and in most cases spray their crops by themselves or by engaging their family members.

**Table 1** Characteristics of sample population

Age group (years)	Sprayers	Non-Sprayers	Total
≤20	06	04	10
21-30	20	21	41
31-40	13	17	30
41-50	15	13	28
51-60	06	02	08
>60	00	03	03
Total	60	60	120

**Table 2** Land holding of respondents

Land holding (acres)	Frequency (%)
00-10	52(43.3)
11-20	35(29.2)
21-30	13(10.8)
31-40	11(9.2)
41-50	05(4.2)
>50	04(3.3)
Total	120

Apart from land proprietorship, education has been a major factor which affects the personality of a farming individual. Education is a compulsory tool for farming. It is evident from Table 3 that most of the individuals included in our study have had education up to matric or lower. According to Galvin et al. (2016), basic education and knowledge could help an individual to follow the precautionary measures while spraying the crops or rendering routine visits to field and they would be more vigilant in plant protection practices. Jolliffe (2004) manifested that education and awareness are the only things which could help an individual belonging to rural community to better perform his both on-farm and off-farm activities such as crop protection activities.

Nevertheless, learning from experience has been the basic human instinct. The more one experienced, the more he would learn. An experienced farmer could perform much better as compared to an uneducated and non-experienced one. With education, he could give a logical reasoning to his performance and make it more efficient. He would be better in other field activities including handling and proper usage of pesticides. Therefore, with the help of his own experience, he could teach other fellow farmers or his followers. In this study, most of the farmers of Sargodha district had near about 10 years or less

experience (Table 4) which seemed one of the basic causes of ill-effects of pesticides experienced by many respondents.

In this study, sample population was divided into two groups. Half of the respondents were those who used to spray their crops by themselves and other half of the respondents were those who used hired labor to spray their crops (Table 5). Furthermore, this was also assessed that either farmers stored pesticides well before time of their actual usage or procured them just at the time of need. Only a small proportion of respondents (08 respondents) preferred to procure and spray pesticides upon finding out that their crops needed pesticide treatment. While 93% of farmers (112 respondents) used to prefer the storage of pesticides in advance for their use at time of need (Table 6). This was mainly due to the distanced agro-markets, inflated prices of chemicals for specific period of crop and time of spray and for the case of emergency (Tariq et al. 2007). Out of those 112 respondents, around 86% farmers used to store pesticides at their farming places (called as 'dhaira' in local language). Remaining prefer the storage of pesticides at their homes. Only four farmers stated that they stored pesticides at home carelessly. Out of 86% farmers who stored pesticides at farm, 62% of them told that they usually stored pesticides carelessly at their farms i.e. not at a secured and locked place (Table 7). This attitude of farmers was a major drawback and could lead to major disaster intentionally or unintentionally such as pesticide poisoning. Similar type of findings such as preparation and storage of pesticides on shelves in the kitchen at home and non-serious behavior of extreme level was identified by Tariq et al. (2007) and Zyoud et al. (2010).

Dealing with pesticides is the matter of great concern. Hahn (1999) discussed that using pesticides in agriculture has been a challenging job for human beings. Generally, farmers did not pay full attention to long term side effects of pesticide residues being left on their skin or clothes. For instance, pesticides usually get rid of human bodies by simple washing the exposed area of body or goes off after few hours without any serious inconvenience. Data collected in study showed that the respondents were not good in

**Table 3** Educational description of respondents

Education level	Frequency (%)
Illiterate	21(17.5)
Primary	25(20.8)
Secondary	23(19.2)
Matric	32(26.7)
Intermediate	15(12.5)
Bachelor	04(3.3)
Total	120

**Table 4** Farming experience of respondents

Farming experience (years)	Frequency (%)
01-05	32(26.7)
06-10	24(20)
11-15	18(15)
16-20	29(24.2)
>20	17(14.2)
Total	120

**Table 5** Spraying method of respondents

Spraying method	Frequency (%)
By themselves	60(50)
By hired labor	60(50)
Total	120

**Table 6** Pesticide usage after purchasing

Usage way of pesticide	Frequency (%)
Purchase and direct use	08(6.7)
Purchase and store before application	112(93.3)
Total	120

**Table 7** Storage of pesticides

Storage place for pesticides	Frequency (%)
Special place at home	11(9.8)
Anywhere at home	04(3.6)
Special place at dera (farm)	28(25)
Anywhere at dera (farm)	69(61.6)
Total	112

employing precautionary measures while applying or post-application of pesticides. For example, they did not consider wearing of rubber boots, using face mask and goggles and proper wasting off the pesticide containers after pesticide usage (Table 8). Most of

them sprayed the chemicals at noon in full sunlight which might be harmful for them. Findings by Zyoud et al. (2010) concluded that farmers did not pay attention to the disposal of empty pesticide containers, wearing of adequate protective clothes and of eating and drinking during application of pesticide.

It was surprising that the results related to symptoms due to pesticide exposure were totally different from the expectations of the authors. Mean and standard deviation of data showed that most of farmers did not come in contact with pesticides in some serious way (Table 9). Occasionally, they felt blurred vision with burning of eyes and excessive salivation during pesticide application. During study, four to five respondents were found who had extremely severe exposure to pesticides. Aside from questionnaire, some respondents informed the data collectors that pesticide spraying personnel did not avoid of drinking, eating and smoking during spray. The same observations were manifested by different authors such as Ecobichon (2001); Ibitayo (2006); Asogwa and Dongo (2009) that the fact of paying not much attention to the precautions could cause pesticide poisoning which might be accidental. The farmers who regularly came in contact with these chemicals could have serious health issues both on long term and short term basis. In developing countries such as Pakistan, farmers have great exposure to pesticides due to the use of even those dangerous and persistent agro-chemicals which have been banned by the Governments decades ago in developed countries. Inappropriate spraying tools or poorly maintained equipment, inadequate storage practices, false application techniques and reuse of old pesticide containers for water storage or food were some basic facts came out in this study due to which farmers could face a great risk of exposure to pesticides.

**Table 8** Adoption of precautionary measures

Precautionary measures	Mean	SD
Keeping pesticides in original container	4.9	0.09
Keeping of pesticides in drinking/eating pots	1.0	0.00
Washing of container after use and dispose off	2.1	1.30
Keep away the spraying material from children approach	4.8	0.78
Post-spray body wash (bath) and hand washing	4.7	0.86
Post-spray changing of clothes	4.3	1.20
Keeping in mind the ETL level of insects in field	4.2	0.93
Wearing of rubber boots	1.1	0.64
Use of face mask and eye goggles	1.7	1.01
Do they spray at noon (at full sunlight)	3.2	1.03
Do they consider wind speed and direction when spraying	4.4	0.85
Reading of pesticide label before mixing and applying pesticide	3.5	1.37

SD: Standard deviation

**Table 9** Harmful effects on the health of farmers

Harmful effects	Mean	SD
Skin allergy or itching	1.9	1.28
Muscle cramps	1.2	0.60
Flu type feeling	1.4	0.84
Blurred vision or eyes burning	1.9	1.01
Suffocation	1.2	0.63
Excessive Salvation	2.2	1.11
Nausea/Vomiting	1.4	0.95
Excessive sweating	1.4	0.84
Unconsciousness/Dizziness	1.04	0.27
Chest suffocation/Pain	1.2	0.51
Lack of appetite	1.2	0.55
Abnormal heart beat	1.9	1.05

SD: Standard deviation

## CONCLUSION

Conclusively, the study pointed out some ill effects of pesticides experienced by many respondents, which might be due to their direct exposure to pesticides. Casual attitude of participants toward handling of pesticides and personal protection was observed in most of the cases. Most of the workers did not use suggested personal protective equipment while dealing with harmful chemicals. Few most severe cases were also found in which their exposure to chemicals led them to serious skin and digestion problems.

## RECOMMENDATIONS

- There should be an extension based policy to teach the farmers regarding handling and spraying of pesticides.
- Preference should be given to the pesticides which have less residual effects in the environment.
- Young farmers should be given more preference rather than old farmers in case of teaching and training as they are energetic and have courage to perform field activities more efficiently.
- Farmers should be encouraged to have routine health check-ups/clinical tests.

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