Pesticide Toxicity in the Farmers of Sindh an Epidemiological Study

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Pesticides being potentially toxic agents and harmful to human and eco-system are deliberately added to our environment for protecting the crops towards better yields- The studies of pesticide toxicity have been ignored in the farmers of Sindh as yet. In this regard the initiative was taken for the epidemiological study. A questionnaire was designed to conduct the interviews of the farmers directly exposed during July –August season. They were supposed to reply about the nature of pesticides, doses sprayed, exposure timings along with duration of spray and health complaints during, after spray and types of toxicity symptoms. 214 male farmers from 11 to 70 years of age who have been exposed to 21 different pesticides of six groups of agro-chemical compounds were called upon to answer. Chlorinated hydrocarbon compound Endosulfan as product and *Organoohos Dhorous* as group containing pesticides, was noted the most frequently used- The age groups 11-20 and 41 - 50 years have been reported as most affected. Two-third of the surveyed population complained for 20 various ailments. Among those vertigo followed by headache, unconsciousness, body allergies, etc as the major symptoms. The highest percent (94.4%) of these were assessed at district Ghotki whereas the lowest affected percent (53.3%) was recorded from district Shikarpur. As a whole 65.2% farmers were noted as affected. This epidemiological study discloses the pesticide toxicity more intensive among the farmers & at higher scale than the WHO recommended classification of pesticides by hazard.
Key words: Pesticidesn toxicity, farmers

Farmers in agriculture fields commonly spray synthetically prepared several pesticide products of various chemical groups. These are referred to as "Economic Poisons" and are observed to be highly toxic to human and eco-system to those the farmers are exposed directly. Increasing need of the food and fiber for the growing population laid emphasize up on local farmer to decrease losses and increase the crop yields with the use of pesticides. In this contest dozens of pesticide brands mostly organophosphorous, pyrethroids and chlorinated hydrocarbon groups are manufactured and imported in Pakistan. Countrywide consumption of the pesticide trend, which has increased from 665 metric tons in1980 to 45680 metric tons in 1999, out of which 27210 metric tons were imported[1]. Where as the annual consumption of formulated pesticides in Pakistan for the year 2000 was 15588.89411 metric tons from which 20% i.e. 3160.9253 metric tons of pesticides was consumed in Sindh[2].

It is observed that the agriculture sector become highly mechanized as well as heavily dependent on agrochemicals, such aggravation of farming has produced higher yields and greater wealth but has also created some problems affecting environment, food and safety of farmers. Some of the workers[3,4,5,6,7,8,9,10] have reported the toxicity symptoms induced by various pesticides independently and in classified groups. According to them organophosphorous group pesticides are responsible for weakness, anorexia, malaise, headache, dizziness, muscle twitching, tremor, nausea, abdominal cramps, diarrhea and sweating. Blurred or dark vision, confusion, tightness in the chest, wheezing, productive cough and pulmonary edema may occur. Unconsciousness and convulsions indicate very severe poisoning. Bradycardia, salivation, and tearing are common symptoms of severe poisoning, in serious cases respiratory failure and death can occur.

Chlorinated Hydrocarbons or organochlorines were reported for apprehension, excitability, dizziness, headache, weakness, and paresthesia piloirrection, salivation, nausea, vomiting, diarrhea, hyperactivity, respiratory distress, difficulty in breathing, imbalance, agitation, a tingling or pricking sensation on the skin and muscle twitching. Confusion, vertigo, loss of appetite, insomnia and temporary deafness was also witnessed. Serious intoxication results tremor, convulsions, unconsciousness and death.

Carbamate Insecticides are recorded to produce similar intoxications to those with organophosphorous compounds including malaise fatigue, muscle weakness/twitching, loss of appetite, salivation, abdominal pain, and diarrhea. Dizziness sweating headache, nausea, vomiting, blurred vision associated with excessive tearing and contracted pupils of the eye are noted. Slurred speech, dyspnoea, bronchospasm, chest tightness, pulmonary edema, convulsions, bradycardia and cardiac complications are also reported. As far as the pyrethroid insecticides are concerned, these have been presented for relatively little risk. Very large doses may rarely cause tremors, salivation, vomiting, diarrhea, irritability, ataxia and convulsions. Dermal contact may result in skin irritation such as stinging, burning, itching, and tingling progressing to numbness by this group of pesticides.

In Pakistan few authors[11,12,13,14] explored the pesticide toxicity only on the basis of residue levels of pesticides in human blood and tissues, no other report is available here in this regard. Epidemiological studies have been ignored and such records are not available even toxicity statistics in the local epidemics.

In Sindh prevalent use of these toxic agents in the agriculture fields has created many health problems and incidences of death in the farmers, which has been reported from time to time as individual case in the local press without producing the epidemiological work as yet. While along with the toxicity symptoms, individuals and the institutions at region and global levels report death caused by the pesticides. Third World records enumerated the pesticides for more than 20,000 fatalities every year and the deaths mostly occur in the developing countries[15].

In view of the above communications for pesticide toxicity towards morbidity and mortality at national and international level, the lesser attention has been observed to the farmers at country and province level. This existing vacuum laid emphasis to step up for the survey of pesticide toxicity in the farmers of Sindh on epidemiological grounds.

Methodology

The information collected by conducting interviews from the farmers, who were exposed to various pesticide sprays over the crops including cotton, vegetable and rice etc in the agriculture fields of thirteen districts of Sindh. A questionnaire was designed on the grounds of W.H.O recommendations and used in the local epidemics. Farmers, who are spray man as well, were interrogated during July-August season, having at least two years professional history of pesticides spray in the agriculture fields. Subjects were supposed to reply about their professional details including nature of pesticide, spray doses, exposure numbers and timings with duration of spray.

Farmers at their doorstep were enquired about symptoms associated with pesticide induced toxicity appeared whether during or after the spray, types of ailments if they had before spray, laboratory/medical examination and taking of any pharmacotherapy either prescribed or self medicated to beat the symptomatology.

Results

An epidemiological survey was conducted on 214 subjects (Farmers) who sprayed multiple brands of various pesticide groups on their crops. The whole population selected for interviews were males between 11-70 years of age divided into age groups of tens, among them the most affected farmers having toxicity symptoms were age group 11-20(89%) and 41-50 years (69%) as indicated in Table 1.

Table 1. Number and percentage of pesticide affectees in various age groups.

Age Group	Affected	Non affected	n=	%age
11 -20	17	2	19	89.47
21-30	39	24	63	61.9
31 -40	45	23	68	66.18
41 -50	32	14	46	69.56
51 -60	3	4	7	42.85
61-70	4	7	11	36.36
Total	140	74	214	65.42

Overall six groups of agro-chemical compounds consisting 36 brands of 21 pesticide products formulated in solution as well as in granular forms, found being sprayed and/or mixed through water flow in the fields and are summarized in Table 2. It was evidenced in this study that chlorinated hydrocarbon product endosulfan branded as thiodan and organophosphorous pesticides as group are most frequently used all over Sindh. Agrochemicals reported by the farmers were analyzed according to the WHO classification by hazard and guidelines to classification 1998-99. It was noted that in twenty one products the hazardous class I a, I b, II, and III were sprayed 19%, 14%, 57% and 9.5% respectively by the farmers of Sindh. The uses of moderately hazardous class II products were at peak followed by extremely hazardous class I

Farmers expressed their health problems with the toxicity consequences, which they suffered during or after their exposure to the pesticides in the agriculture fields. The toxicity symptoms and their frequency as reported by the individual are mentioned in Table 3. This reveals that among all twenty symptoms, "Vertigo" was the most common feature 31 .3% of toxic effects crumpled the farmers. This follows headache 22.4%, body allergy 17.8%, face and eyes allergy 13.5%, sinking of heart (Bradycardia) 12.6% and unconsciousness 12.2%.

Table 2. Frequency of Pesticides sprayed, in Groups along with mumber of their products, formulated in number of brands and divided in WHO hazardous class.

Chemical Groups	Sprayed Frequency	Pesticide Products	Formulated Brands	WHO Hazard Class			
				Ia	Ib	II	III
Organophosphorous	157	9	17	3	3	3	-
Chlorinated hydrocarbon	59	1	5	-	-	1	-
Pyrethroid	46	6	8	-	-	6	-
Carbamate	41	3	4	1	-	2	-
Thiureas	4	1	1	-	-	-	1
Acetamide	3	1	1	-	-	-	1

Table 3. Percentage of Various Symptoms reported by the Affected Farmers.

Symptoms	%age
Vertigo	31.3
Headache	22.4
Body allergies	17.8
Bradycardia	12.6
Unconsciousness	12.2
Face allergy	9.8
Vomiting	8.9
Dyspnea	7
Heavy head	6.5
Eye irritation	3.7
Flu	3.7
Nausea	3.3
Fever	2.8
Abdominal pain	2.3
Fits	1.9
Chest pain	0.93
Diarrhea	0.41
Body pain	0.41
Sore throat	0.41
Convulsions	0.41

Tables 4 shows district wise distribution of the farmers their frequent exposures to the pesticides and stated having Symptomatology. The highest affected percentage assessed was 94.4 at district Ghotki, followed by Mirpurkhas 92% where as the lowest 53.3% of affected farmers was recorded from district Shikarpur. It is also evident from this table that in all the areas surveyed more than 50% of the intoxication is reported and as a whole 65.2% were noted as affected.

Table 4. District wise Distribution of Farmers along with Frequency of Exposures, and their Affected Percentage.

District	n=	Exposure Frequency	Symptom Frequency	%age Affected
Badin	21	20	36	55.5
Dadu	11	14	20	70
Ghotki	10	17	18	94.4
Hyderabad	22	42	57	73.6
Khairpur	12	46	83	55.4
Larkana	18	15	28	53.5
Mirpurkhas	18	47	51	92
Nawabshah	19	28	42	66.6
Nosehroferoz	13	18	30	60
Sanghar	20	18	27	66.6
Shikarpur	17	40	75	53.3
Sukkur	18	13	20	65
Thatta	15	16	25	64
Total	214	334	512	65.2

Discussion

The uses of pesticides in agriculture sector become too helpful but too injurious to health of the farmers and recorded for increased residue levels in the agriculture products as well. In the regional epidemiological concerns the agro-chemicals are stated as highly toxic for the health of a person exposed 16. This has been confirmed in this survey where the farmers of Ghotki and Mirpurkhas epidemics affected utmost furthermore higher frequency of intoxication recorded at all districts is of very serious nature.

This study shows that the most affected group belonged to teenagers (11 – 20 years of age) the symptoms noted 89.47%, similarly reported for teenagers in the work done on 'organophosphorous and 'carbamate' pesticides' poisoning at north Jordan 17. According to the data collected among all, organophosphorous group products sold/consumed as number one (1356.258 MT) in Sindh. The most customary availability of this group in agriculture environment could be one of the reasons for poisoning in the teenagers, an other link might be their growing age where greater activity of bodily processes to result the increased amount of pesticide metabolites through biotransformation. The succeeding age groups showing a fall to have the toxicity symptoms probably are connected with the development of immunity towards the pesticides in their bodies, for which further studies are needed.

The follower age group 41–50 years had 69.56% of toxicity symptoms. Their active presence in the agriculture fields as sprayman and supervisor during spray stands for the lengthy exposures of the pesticides. That might be related to the reasons of toxicity, as compared to the age group of seniors (61–70 years), which were noted with lesser toxic effects (36.36%).

In this study the risk of the pesticide toxicity in the farmers was assessed as higher, the reasons could be (a) tissue deposition of chlorinated hydrocarbon products availability and use as indicated by the larger sales (453.034 MT in Sindh) (b) pesticide bioavailability contributed by pyrethroid group of pesticides bearing lipophilic property[18], as this group is also is also utilized more in agriculture fields of Sindh, (c) expeditious dermal absorption of organophosphorous group pesticides, which is older, cheaper and regularly repeated in its use.

Symptomatology generated by the pesticides noted in this study reflects the work done but among the customary availability of hazardous class II pesticide products, except the cyhaluthrin, dimethoate of organophosphorous, fenvalerate of pyrethroids and carbaryl of carbamate groups all others were reported for "unconsciousness" a symptom of severity, which did not support the WHO hazardous classification in the local environment. Vertigo appeared as a major illustration with the higher intensity poisoning symptoms of circulatory, nervous, and

respiratory problems, digestive tract upsetting and allergy etc. that is not reported as such before.

It all seems to be due to the uncontrolled and freely availability of multi-nature agro chemicals, their blind use that include many banned and restricted use products, duration of the exposures and hot atmosphere that forces the farmers to ignore the protection clothing. This epidemiological survey verified the higher hazardous and dirty role of the pesticides affecting farmers of Sindh. To avoid such complications it is suggested that switching over to the safety of commodity and community health in agriculture sector is not tolerable, therefore to reduce/control the reported pesticide toxicity in the farmers of Sindh all the globally banned or restricted products should be legally treated accordingly. Farmers should be fully aware to dangers of toxicity and be skilled by agro-industry marketing personnel and government agencies to handle the pesticides with maximum safety according to international standards and rules. Government of Pakistan in accord with WTO has now emphasized to avoid the use of agrochemicals and recently launched biological control programme including integrated pest management (IPM). Further more "a toxicology laboratory and monitory units for periodical analysis of pesticide toxicity" should be established to practically reduce the risk of poisonous effects of pesticides on public generally and on the farmers particularly.

Conclusion

The pesticide toxicity noticed in this epidemiological study is regardful, the poisonous effects of the various agrochemicals were recorded as highest and had crossed the WHO hazardous classification particularly class II, the moderately toxic group. Most of the areas need special attention for the health safety of the farmer's community. Pesticides intoxication is not taken seriously and in this connection effective toxicology progammes are required to control the health risk of the larger population.

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