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Are personal protective equipment of pesticides use a priority of farmers at the cost of health?

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Abstract

Pesticides act like double edge sword i.e. on one side it helps to protect crops but on the other side it has great adverse effect if not handled properly. Personal protective equipment are the gears which can minimize the adverse health effect over the farmer's health. Keeping in view the importance of farmer's health at stake due to ill practices of pesticides use the present study was conducted with an attempt to identify whether personal protective equipment are been in use of the farming community, their knowledge about misuse of pesticides and self-reported acute poisoning cases. The instant study was conducted in Khyber Pakhtunkhwa province of Pakistan during 2018. It was found that majority of the respondents were not utilizing personal protective equipment whereas were also not aware fully from the pictograms made over pesticides containers for the safe handling of pesticides. Furthermore, it was also found that majority of the farmers had been suffered from various acute poisoning due to pesticides use i.e. head ach, itching, eye irritation, blisters, shortness of breath, burning sensation, nausea etc. It was also found that following labels/instructions of pesticides containers has significantly decreases the acute poisoning cases. It is suggested that the farmers should be properly trained in appropriate use of pesticides and understanding of labels for following proper recommendations.

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Introduction

Agrochemical is a common term encompassing various chemical products that are used in agricultural activities. In most cases, it denotes wide range of pesticides including insecticides, herbicides, and fungicides. The majority of pesticides are used to control pests' invasion and control of vectors of human and animal diseases (Ecobichon, 2001). Crop losses due to pests' invasion and soil infertility are serious threats in both developed and developing countries (Henry, 2003). There is a large variety of pesticides intended to kill particular pests.

In Pakistan, more than 70% population depends on the agro-based activities for its economy and dietary necessities and mostly farmers are illiterate having primary education comprising 68% male and 29% female working in agriculture (Anwar, 2008). Mostly (89%) men and women farmers are vulnerable group involved in the spraying of pesticide and are the worst hit. Supplementary to this, environmental pollution due to production of pesticides from industrial emissions resulted in the manifestation of these chemicals and their residues in every section of environment samples, i.e. water, soil air, fruits, vegetables, meat, milk and water.

The livestock, water sources, food etc. come next in the ladder of affectees. Additionally, malnutrition and dehydration increase the susceptibility of pesticides poisoning in them (Anwar, 2008; Sharma *et al.,* 2010).

As farmers are not properly educated regarding pesticide use, and due to poor literacy rate, farmer can't read and understand the awareness brochures of pesticides which are written and printed in English and Urdu languages.

They made to believe by the company representative that pesticides are the only medication to their crops; farmer used them without knowing the insect population and crop condition. They consider and believed pesticides as cure rather than a basis of poison (Anwar, 2008). Its leakage during transportation, field application, storage and 50% of the farmers do not use protective clothing and masks during spray. Sometimes farmers retains edible oil, drinking water and milk in pesticides empty containers and their indiscriminate use due to Government's stress-free policies on pesticide application causes disturbance in the ecosystem (Khan *et al.,* 2011).

Choice of pesticides application greatly affects the society at large because pesticides affect the general public in multiple ways. Despite of the negative effect to the users of pesticides the pesticides affect the vernal public or consumers exposed to it directly or through food (Menzler- Hokkanen, 2006). Regardless of the serious issues/risks concern to pesticides the farming community is busy using it in order to achieve high yield by protecting the crop from pest. Due to these facts the *Public Health* sector has serious concern about it as epidemiological studies had reported significant association of various sorts of cancers, neurologic pathologies, respiratory symptoms and hormonal and reproductive abnormalities because of pesticides. Past studies revealed that the families who reside beside the agricultural fields have high level of pesticides contents in their bodies (McCauley *et al.,* 2001; Quandt *et al.,* 2004). Similarly, during the application of pesticides farmers usually suffer from the damage (Tariq *et al.,* 2007). Even in the previous studies it is revealed that the pesticides adverse effect causes point mutation and chromosomal mutation in farming community resulting in cell transformation (Larrea *et al.,* 2010).

Therefore, due to adverse effects of non-utilization of personal protective equipment during pesticides practices the present study was conducted with the following objectives; to identify the knowledge about the safety pictograms of pesticides, whether personal protective equipment are been used by the farming community or not?, to check the farmers knowledge about misuse of pesticides and to examine the acute poisoning cases to the farming community due to pesticides use.

Material and methods

Population of study

The population of the study was the respondents from the province of Khyber Pakhtunkhwa (KP) province of Pakistan which is divided into 4 Agro Ecological Zones *viz*. Northern Mountainous Zone, Eastern Mountainous Zone, Central Plain Valley and Southern Piedmont Plain. Therefore a Multistage Sampling technique was utilized for selection of the respondents.

Multistage sampling

The multistage or cluster sampling is imperative because it is economically apt and secondly it is suitable when the sampling frame of the individual elements is not available. It is the selection of sample from the subset at each stage. The multistage sampling of the respondents is as under.

Stage 1: Selection of districts: One district was selected from each Agro ecological zones. In this connection District Dera Ismail Khan (D.I.Khan) was selected from Southern Piedmont Plain, District Charsadda was selected from Central Plain Valley, District Mansehra was selected from Eastren Mountainous Zone whereas District Swat was selected from Northern Mountainous Zone.

Stage II: Selection of tehsils: Single Tehsil was selected from each district keeping in mind the time and financial resource. The tehsils selected were as; Tehsil Paharpur, selected from district D.I.Khan, Tehsil Charsada was selected in district Charsada, Tehsil Mansehra was selected in Mansehra whereas Tehsil Matta was selected in Swat district. All these tehsils were selected in collaboration of Agriculture Extension Department Govt. of KP and these were the agriculture rich tehsils.

Stage III: Selection of Union councils: From each selected Tehsils single Unions council was selected i.e. Union council Band Kurai, Baidara, Khanmai, Baffa was selected from tehsil Paharpur, Matta, Charsadda and Mansehra respectively. These UCs were selected purposively with the collaboration of Agriculture Extension Department that these UCs are the agriculturally rich.

Stage IV: Selection of Sample size and respondents: Due to no proper study available regarding the selection of the potential respondents as sampling units, the sample size was determined on assumed variability such as 50 % for the farmers those are involved in the use of pesticides on their farms as suggested by Kasely and Kumar (1989). Consequently, the number of farmers (respondents) included in the present study were determined using formula for unknown population which is defined in the following Equation (i).

$n = Z^2 \sigma^2 / d^2$---------- (i)

Where, Z^2= Statistic for a level of confidence. (For the level of confidence of 95%, which is conventional, Z value is 1.96).

n = Sample size

σ= estimated standard deviation that 50% of the farmers would apply pesticides in their fields

d = precision. (d is considered 0.05 to produce good precision and smaller error of estimate) (5%)

$$\frac{(1.96)^2\ (50)^2}{(5)^2} = 384$$

Therefore through equal allocation formula, 96 respondents were selected from each of the selected Tehsil. The respondents were selected using convenience sampling technique.

Research design

Cross sectional survey design was utilized as a part of the current investigation. Data collection at one point is the fundamental concept of cross sectional survey. It is best suited in determining the perceptions, expectations and respondents interests. The cross sectional survey is also most appropriate in a view to establish correlation between two and more variables and could be examined by a range of methods. It is also useful for small as well as for large population by selecting studying samples, to discover the incidence

distribution and relationships of various social and psychological aspects.

Research instrument

Well-structured interview schedule was developed which was based on open, close and partially open ended questions. The questions were based on the precautionary measures and PPE used while using pesticides and self-reported acute poisoning cases. Face and content validity of the interview schedule was measured. Face validity was measured by asking questions from the respondents who were not actually involved in the study and appropriate response was obtained whereas for content validity the research instrument was checked by the panel of experts from Agriculture Extension Education and Communication. The University of Agriculture Peshawar and necessary amendments were made thereafter. For reliability of the research instrument, data from 30 farmers were collected which was not included in actual study. After collection of the data, the data were subjected to SPSS ver. 20 for scale reduction test i.e. Cronbach's alpha test (Cronbach, 1951). Cronbach alpha value obtained was 0.831 representing good internal consistency.

Data collection

Data collected for the present study was based on both primary and secondary data. Various published and unpublished sources were used for the purpose of secondary data whereas primary data were collected using well developed interview schedule. Face to face interviews were conducted in order to record firsthand information and to remove any ambiguity of the respondents as and when prevails regarding any question.

Statistical analysis of the data

Statistical Package for Social Sciences (SPSS) ver. 20 was used for analysis of the data. Simple frequency, percentages and chi-square test was used. Chi-Square test can be expressed as (equation (ii):

$$\chi^2 = \sum_{i=1}^{r}\sum_{j=1}^{c}\frac{(O_{ij}-e_{ij})^2}{e_{ij}} \quad \text{..... (ii)}$$

This represents that it follows χ^2-distribution with $(r-1)(c-1)$ degrees of freedom under null hypothesis (H_o). However, O_{ij} is the observed frequency and e_{ij} is the expected frequency.

Results and discussion

Knowledge regarding pictograms

Pesticide labels contain self-explanatory pictures (for users with limited reading abilities) on safe use, safe handling and potential hazards. Pesticides when used in an incorrect or improper way may seriously endanger the health of farmers and their families, consumers, and the environment. Results in Table 2 showed that only 52.9% of the respondents indicated the "*handle carefully-liquid product*" pictogram whereas "*handle carefully-powder or granules product*" was reported by 58.3% of the respondents. Similarly overwhelming majority (63.8%) of the respondents had the knowledge about the "*use a sprayer*" pictogram.

Furthermore, 54.9, 72.2 and 71% of the respondents were aware about the pictogram of "*using protective gloves, wash after use* and *wear mask* pictogram respectively. Awareness of *wear a protective overall, use a shield and wear glasses and wear a boot* pictogram were reported by 46.1, 51.8 and 56% respectively.

Table 1. Overall Sketch of the Sampling Procedure Using Multistage Sampling Technique.

Sr. #	Zones	Districts	Tehsils	Union Council	Sample
1	Northern Mountainous Zone	Swat	Matta	Baidara	96
2	Eastern Mountainous zone	Mansehra	Mansehra	Baffa	96
3	Central Plain valley	Charsadda	Charsadda	Khanmai	96
4	Southern piedmont Plain	D.I.Khan	Paharpur	Bandkurai	96
		Total			384

Similarly, 69.8% of the respondents were aware of "*dangerous for livestock and poultry*" pictogram, *dangerous for wildlife* (59.1%), *dangerous for fish/do no contaminate water* (72.1%), "*keep locked away or out of reach from children* (44.8%) whereas, almost 63% of the respondents were aware of the "*poison*" pictogram. The most unknown pictogram to majority of the respondents was the "*corrosive*" pictogram as reported by the only 35.9% of the total respondents (Table 2).

Table 2. Distribution of respondents regarding knowledge about activity pictogram.

Activity Pictogram			
Pictogram	Meaning	Yes	No
	Handle Carefully-Liquid Product	203(52.9)	181(47.1)
	Handle Carefully- Powder or Granules Product	224(58.3)	160(41.7)
	Use a Sprayer	245(63.8)	139(36.2)
Advisory Pictogram			
	Use Protective Gloves	211(54.9)	173(45.1)
	Wash after Use	280(72.9)	104(27.1)
	Wear a Mask	272(70.8)	112(29.2)
	Wear a Protective Overall	177(46.1)	207(53.9)
	Use a Shield	199(51.8)	185(48.2)
	Wear Glasses	215(56.0)	169(44.0)
	Wear Boots	217(56.5)	167(43.5)
	Wear Respirator	195(50.8)	189(49.2)
	Wear Protective Clothing	182(47.4)	202(52.6)
	Dangerous for Livestock and Poultry	268(69.8)	116(30.2)
	Dangerous for Wildlife	227(59.1)	157(40.9)
	Dangerous for fish/do no Contaminate Water	277(72.1)	107(27.9)
	Keep Locked Away or Out of Reach from Children	172(44.8)	212(55.2)
	Poison	241(62.8)	143(37.2)

	Corrosive	138(35.9)	246(64.1)
	Flammable	251(65.4)	133(34.6)
	Explosive	208(54.2)	176(45.8)
	Toxicity Levels Pictorgram		
	Slightly Hazardous (Caution)	109(28.4)	275(71.6)
	Moderate Hazard (Warning)	228(59.4)	156(40.6)
	Highly Hazard (Danger)	138(35.9)	246(64.1)
	Extremely Toxic (Oral Lethal Dose 1-50mg/kg)	211(54.9)	173(45.1)
	Highly Toxic (Oral Lethal Dose 50-500 mg/kg)	161(41.9)	223(58.1)
	Moderately Toxic (Oral Lethal Dose 501-5000 mg/kg)	77(20.1)	307(79.9)
	Slightly Toxic (Oral Lethal Dose >5000 mg/kg)	130(33.9)	254(66.1)

Those respondents who were aware of the *"corrosive"* pictogram reported that they have only knowledge about that pictogram though they haven't seen such type of pictogram on any pesticides container. About 65.4% of the respondents were aware of the "*flammable"* Pictogram.

Table 3. Precautionary Measures/Personal Protective Equipment (PPE) Farmers used during Pesticides Practices.

Precautionary measures	Categories	Frequency	Percentage
Using Mask during Spraying	Yes	295	76.8
	No	89	23.2
Wearing Separate Clothes for Spray Purpose	Yes	209	54.4
	No	175	45.6
Action when Pesticides Came in Contact with Body	Do Nothing	106	27.6
	Washing	215	56.0
	Consult Doctor	63	16.4
Hand Covering Material While Mixing Pesticides	Hand Cover with Clothes	76	19.8
	Hand Cover with Plastic Bags	113	29.4
	Hand Cover with Gloves	128	33.3
	Bear hand	67	17.4
Taking a Bath after Pesticides Use	Yes	226	58.9
	No	158	41.1
Smoking while Spraying	Yes	132	34.4
	No	252	65.6
Disposal of Empty Bottles of Pesticides	Burned	99	25.8
	Disposed with Usual trash	131	34.1
	Use in House	93	24.2

	Throwing away Alongside Field	61	15.9
Change Clothes after Application of Pesticides	Yes	241	62.8
	No	143	37.2
Wearing Boots while Spraying	Yes	267	69.5
	No	117	30.5
Using Mixture Equipment while mixing	Yes	242	63.0
	No	142	37.0
Covering Nose and Mouth with any other thing (Cloth)	Yes	320	83.3
	No	64	16.7
Knowledge about the Direction of Wind to Spray	Yes	237	61.7
	No	147	38.3
Mixing of Pesticides	Open Air	290	75.5
	Close room	94	24.5
Eat or Drink while Spraying	Yes	182	47.4
	No	202	52.6
Using Goggles	Yes	245	63.8
	No	139	36.2
Using Glasses	Yes	184	47.9
	No	200	52.1
Using Face shield	Yes	71	18.5
	No	313	81.5
Use respirator	Yes	127	33.1
	No	257	66.9

Data regarding toxicity level pictogram showed that majority (71.6%) of the respondents were not aware of the "*slightly hazardous"* pictogram followed by 59.4% who were aware of the "*moderate hazard"* whereas "*highly hazard"* pictogram was reported by only 35.9% of the respondents. Similarly data in Table 2 showed that "*extremely toxic"* color pictogram was reported by 54.9% of the respondents which might be due to the fact that red color is always a sign of danger and thus they were aware that this pictogram is extremely toxic. About 42% of the respondents had knowledge about the *"highly toxic"* color pictogram whereas "*moderately toxic"* pictogram was known to only 20.1% of the respondents. Similarly 33.9% of the respondents were familiar with the "*slightly toxic"* color pictogram.

Table 4. Distribution of respondents regarding Knowledge about the Misuse of Pesticides.

Particulars	Yes	No
Using banned agricultural pesticides	89(23.2)	295(76.8)
Knowledge of proper nozzles	270(70.3)	114(29.7)
Knowledge of ET level of particular pest	119(31.0)	265(69.0)
Knowledge about mode of action	140(36.5)	244(63.5)
Knowledge about the expiry of pesticides	187(48.7)	197(51.3)
Knowledge about proper solution preparation	246(64.1)	138(35.9)
Using high doze than recommended	257(66.9)	127(33.1)
Knowledge about the toxicity levels of pesticides	185(48.2)	199(51.8)

Values in Parenthesis are Percentages.

Our results are in contrast with that of Giri *et al.* (2009) who reported that majority of the respondents were not able to understand the activity pictograms. Mengistie *et al.* (2017) reported that majority of the respondents had no knowledge about the pictogram like *wear boots, wear protective clothing, use a face shield* and *wash hand after use* however our results are in line with them regarding *wear a boot* pictogram. The instant results are not in conformity with that of Mengistie *et al.* (2017) who reported that

majority of the respondents had no knowledge about the "*dangerous for fish/do no contaminate water*" and "*keep locked away or out of reach from children*" which might be due to the fact that majority of the respondents in their study were illiterate i.e. 55%. Our results are in contrast with that of Giri *et al.* (2009) who reported that enviromental & other hazards pictogram were poorly understood by majority of the respondents.

Table 5. Distribution of Respondents Regarding Self-Reported Symptoms of Pesticides Use.

Symptom	Yes	No	Symptom	Yes	No
Headache	300(78.1)	84(21.9)	Eye irritation	244(63.5)	140(36.5)
Excessive sweating	151(39.3)	233(60.7)	Fatigue	110(28.6)	274(71.4)
Itching	287(74.7)	97(25.3)	Shortness of breath	262(68.2)	122(31.8)
Sneezing	187(48.7)	197(51.3)	Fever	193(50.3)	191(49.7)
Cough	131(34.1)	253(65.9)	Insomnia	95(24.7)	289(75.3)
Stomach ach	89(23.2)	295(76.8)	Chest pain	98(25.5)	286(74.5)
Nausea	166(43.2)	218(56.8)	Blisters	234(60.9)	150(39.1)
Dizziness	95(24.7)	289(75.3)	Catarrh	90(23.4)	294(76.6)
Feeling weak	148(38.5)	236(61.5)	Body pain	132(34.4)	252(65.6)
Diarrhea	138(35.9)	246(64.1)	Burning sensation	297(77.3)	87(22.7)
Difficulty in Seeing	103(26.8)	281(73.2)			

Precautionary measures/personal protective equipment (ppe) farmers used during pesticides practices

Data in Table 3 depict that majority (76.8%) of the respondents were using masks during spraying whereas 56% of the respondents reported that they simply wash it with water when pesticides came in contact with body. It was also found that 33% of the respondents used to wear gloves while mixing pesticides whereas 20% of the respondents responded that they cover hands with clothes.

About 59% of the respondents use to take a bath after pesticides application whereas, 41.14% of the respondents didn't take bath. Smoking while spraying was reported by only 34.4% of the respondents whereas overwhelming majority (65.6%) never used to smoke while spraying pesticides.

Table 6. Association among Activity Pictogram and Demographic Attributes.

			Activity Pictogram									
Sr. #	Pictogram	Meaning	Age		Literacy		Land Holding		Involvement in farming		Farming experience	
			χ^2	γ	χ^2	γ	χ^2	γ	χ^2	γ	χ^2	γ
1		Handle Carefully-Liquid Product	16.929**	-0.282	104.547**	0.606	35.253**	0.229	9.962**	-0.332	69.065**	-0.497
2		Handle Carefully-powder or granules product	14.427**	-0.211	97.509**	0.637	30.257**	0.338	8.519**	-0.316	35.909**	0.374
3		Use a sprayer	16.243**	-0.228	135.204**	0.762	39.100**	0.143	11.422**	-0.378	95.210**	-0.320

		Advisory Pictograms										
4		Use protective gloves	6.632ns	--	122.197**	0.714	9.257ns	--	7.756ns	--	97.66**	-0.514
5		Wash after use	12.343*	-0.271	88.627**	0.706	4.079ns	--	2.849ns	--	61.93**	-0.490
6		Wear a mask	7.750ns	--	98.133**	0.713	34.191*	-0.108	7.742ns	--	2.324ns	--
7		Wear a protective overall	12.302*	-0.279	88.731**	0.569	2.664ns	--	16.180*	--	71.151**	-0.652
8		Use a shield	37.774**	-0.340	148.968**	0.513	50.023*	-0.204	9.128ns	--	86.339**	-0.531
9		Wear glasses	14.592*	-0.103	134.048**	0.702	43.100*	-0.176	7.334ns	--	8.473ns	--
10		Wear boots	20.788*	-0.258	117.347**	0.687	31.623*	-0.110	10.309ns	--	4.099ns	--
11		Wear respirator	20.090*	-0.256	157.334**	0.698	8.275ns	--	7.146ns	--	65.647**	-0.471
12		Wear Protective Clothing	59.427**	-0.459	39.257*	0.051	6.250ns	--	2.926ns	--	81.321**	-0.588
13		Dangerous for livestock and poultry	7.513ns	-.0274	104.330**	0.672	32.042*	0.024	8.090ns	--	82.249**	0.409
14		Dangerous for wildlife	0.688ns	--	83.033**	0.624	6.671ns		16.074*	-0.423	58.776**	0.524
15		Dangerous for fish/do no contaminate water	40.577*	-0.558	83.722**	0.638	25.234*	-0.119	10.313ns	--	99.736**	0.612
16		Keep locked away or out of reach from children	9.472ns	-0.227	88.538**	0.569	33.201*	-0.047	9.552ns	--	66.037**	0.617
17		Poison	21.721*	-0.333	131.189**	0.739	38.714*	0.081	9.008ns	--	112.595**	0.596
18		Corrosive	48.960*	-0.522	59.887*	0.498	31.016*	-0.335	0.243ns	--	74.015**	0.697

19		Flammable	17.684*	-0.284	126.408**	0.756	37.700*	0.105	8.673ns	--	113.411**	0.508
20		Explosive	0.324ns	--	93.867**	0.611	8.498ns	--	24.422*	-0.507	70.941**	0.575
		Toxicity Levels Pictorgram										
21		Slightly Hazardous (Caution)	12.166*	-0.242	41.177**	0.320	2.659ns	--	202ns	--	22.259*	0.322
22		Moderate Hazard (Warning)	7.520ns	--	86.895**	0.556	9.083ns	--	10.859ns	--	42.546**	0.518
23		Highly Hazard (Danger)	13.374*	-0.183	98.074**	0.670	4.748ns	--	29.268*	-0.536	44.378**	0.559
24		Extremely Toxic (Oral Lethal Dose 1 -50mg/kg)	2.667ns	--	133.750**	0.754	55.958**	0.243	18.437*	0.448	65.896**	^{Y} = 0.56
25		Highly Toxic (Oral Lethal Dose 50-500 mg/kg)	9.864*	-0.269	49.700*	0.436	1.531ns		0.147ns	0.042	37.381*	^{Y} = 0.491
26		Moderately Toxic (Oral Lethal Dose 501-5000 mg/kg)	50.416**	-0.342	54.552*	0.457	20.110*	-0.035	6.247ns	--	23.873*	^{Y} = 0.491
27		Slightly Toxic (Oral Lethal Dose >5000 mg/kg)	21.250**	-0.006	49.663*	0.501	68.299**	-0.342	90.501**	-0.803	23.845*	^{Y} =0.426

*=significance at 5% level of probability, **=significance at 1% level of probability, ns= non-significant.

Disposal of empty pesticides bottle in usual trash was reported by 34.1% whereas 24.2% of the respondents reported that they use the bottle in home for various purposes after cleaning with water thoroughly. Similarly, 62.8% of the respondents reported that they change the clothes after pesticides application (Table 3). From the instant results it can be concluded that only 54% of the farmers were using separate clothes for spraying purpose but here the majority were of the view that they use to change clothes after spraying. This showed that in spite of wearing separate clothes they change the clothes after spraying. Moreover, overwhelming majority (69.5%) reported that they wear boots while spraying. It was also found that majority (63%) of the respondents were using various mixing equipment whereas, 37%

of the respondents were not using mixing equipment for pesticides mixing. Overwhelming majority (83.3%) of the respondents was covering their noses prior to apply pesticides as a precautionary measure whereas, 16.7% of the respondents were not covering their nose (Table 3).

Mixing pesticides in open air and close air also has effect on the human being i.e. in close room there is no fresh air and inhaling the fumes of pesticides may result in acute diseases. It was found that majority (75.5%) of the respondents were mixing pesticides in open air whereas, 24.5% were mixing pesticides in close room. This might be due to the fact that majority of the farmers use to take pesticides to the field and took with them all the spraying equipment and there they prepare the solution and apply as well. Similarly majority (52.6%) of the respondents didn't eat or drink while spraying whereas, 47.4% of the respondents reported that they usually eat or drink while spraying. Majority (52.1%) of the respondents were not wearing glasses while applying pesticides whereas, 47.9% of the respondents were wearing glasses.

Table 7. Distribution of respondents regarding they follow instruction on labels.

UCs	Do you Follow Instruction		Total
	Yes	No	
Bandkurai	65(16.9)	31(8.1)	96(25)
Khanmai	51(13.3)	45(11.7)	96(25)
Baffa	48(12.5)	48(12.5)	96(25)
Baidara	60(15.6)	36(9.4)	96(25)
Total	224(58.3)	160(41.7)	384

Values in Parenthesis are Percentages.

Instant results showed that however majority of the farmers were using personal protective equipment but some of the respondents were also busy in ill practices and thus put their health at stake. Our results are in conformity with that of Giri *et al.* (2009) who also reported that majority of the respondents use to cover their nose and wear protective clothing whereas Mengistie *et al.* (2017) reported that majority of the respondents didn't wear proper clothes during spraying. Similarly, in present study it was found that most of the farmers never use to smoke or chewing gum while spraying which indicated a good practice of farming community. Both smoking and chewing gum may increase the pesticide exposure because of more frequent hand to mouth contact. Previous studies (Manyilizu *et al.,* 2017) also indicated that with smoking during pesticide application significantly increased the risk of chest pain.

Sainju (2015) also reported that majority of the respondents didn't smoke cigarette while spraying pesticides. In the instant study during close observation of spraying practices at the site revealed some unsafe practices and most of the farmers were of the view that we feel uncomfortable with the wearing of the separate clothes, boots, goggles etc. for spraying and thus they were reluctant for safe spray moreover, throwing away empty pesticide container was also observed which can be hazardous because of residues left inside. Pesticide labels have specific instructions on proper disposal procedures.

The common practices of throwing the empty pesticide container in the field or garbage were dangerous because they lead to environmental pollution. Some findings were supported by Saleh *et al.* (1995) who reported that most of the farmers disposed of empty containers around or inside the farm after damaging them so that they cannot be reused. Similar findings regarding the disposal of empty pesticide bottles have also been reported by Huang *et al.* (2000); they further concluded that some of the farmers also kept the empty bottles for

other uses i.e. domestic use.

Knowledge about the Misuse of Pesticides

Data in Table 4 depict that majority (76.8%) of the respondents had no knowledge about the banned pesticides whereas 70.3% of the respondents had proper knowledge about the nozzles of pesticides sprayer. Similarly 29.7% of the respondents reported that they have no proper knowledge about the nozzles. Knowledge about the Economic Threshold Level (ETL) of particular pest were known to only 31% of the respondents. It was found that majority (63.5%) of the respondents were unaware of the mode of action of pesticides whereas, only 36.5% of the respondents were aware of the mode of action of pesticides whereas 51.3% of the respondents were unaware of the expiry of pesticides because of the negligence and some of them were of the view that on most of the pesticide packing the expiry is not mentioned thus they don't care about checking the expiry of pesticides. Overwhelming majority (64.1%) of the respondents had the knowledge about the pesticides proper solution preparation whereas rests of the respondents were not aware of the proper solution preparation thus involved in the misuse of pesticides (Table 4).

Table 8. Association among self-reported symptoms and following instructions on labels.

Symptom	χ^2 Value	$^{\gamma}$ Value
Headache	2.632ns	0.534
Excessive sweating	8.906*	-0.306
Itching	3.264ns	0.113
Sneezing	26.983**	-0.501
Cough	126.021**	-0.88
Stomach ach	18.56*	-0.34
Nausea	189.214**	-0.571
Dizziness	22.38*	-0.528
Feeling weak	5.146ns	0.24
Diarrhea	67.187**	-0.767
Difficulty in Seeing	5.795ns	-0.632
Eye irritation	142.649**	-0.232
Fatigue	3.562ns	-0.025
Shortness of Breath	70.588**	-0.575
Fever	6.25ns	-0.131
Sleeplessness/insomnia	7.470ns	-0.043
Chest pain	4.27ns	0.13
Blisters	8.97*	-0.17
Catarrh	7.937*	-0.88
Body pain	143.673**	-0.906
Burning sensation	30.270*	-0.669

*=significance at 5% level of probability, **=significance at 1% level of probability, ns= non-significant.

Using high doze than recommended is also one of the factor of misuse of pesticides. It was found that majority (66.9%) of the respondents were using high dose than recommended which was because of the fact that they were of the view that with the recommended or low dose we are unable to control pests. Knowledge about the toxicity level of the pesticides is also an important factor because those who know about the toxicity level of pesticides will not use the extremely hazardous and highly hazardous pesticides in order to not contaminate the environment and so the human health. It was found that majority (51.8%) of the respondents were aware of the toxicity level of the pesticides whereas, 48.2%

of the respondents reported that they had no proper knowledge about the toxicity levels.

Results showed that majority of the respondents were unaware from the various factors through which they were busy in misuse of pesticides i.e. through improper nozzles there are always high chances of misuse of pesticides i.e. for applying pesticides against insects and one use the nozzles with big droplet size may results in stress to crop. Similarly, using small droplet nozzles for controlling weeds will not control the weeds effectively and ultimately will increase the number of sprays.

This is due to the fact that insect body is of small size and small droplet size is efficient to kill the insect, giving no or less stress to plants whereas in case of the weeds the surface area of the weeds is large enough thus requires big droplet size of spray for effective control. Similarly, majority of the respondents were unaware from the mode of action of pesticides and thus busy in misuse. Every pesticide has its separate mode of action some of them are for preventive purposes, some are for curative purpose i.e. some are systematic and some are contact pesticides. Thus applying contact pesticides as a preventive measure is the misuse of pesticides whereas, applying contact pesticides as preventive measures is totally wastage of pesticides and money.

Self-Reported Symptoms of Pesticides Use

Although lack of personal protection and risky behaviors were common among most of the respondents, there were some differences reported between respondents. Data illustrated in Table 5 show that majority (78.1%) of the respondents had been through headache after application of pesticides, excessive sweating was reported by 39.3%, itching (74.7%) whereas severe sneezing was reported by 48.7% after application of the pesticides. This might be due to the fact that while spraying the pesticides contaminates air which in return when inhaled inside create sneezing problems. Cough was reported by 34.1% of the respondents whereas stomach ache was reported by 23.2%. Majority of them were those who used to eat and drink while spraying or didn't wash their hands properly after the application of pesticides. Nausea was reported by 43.2% of the respondents. This is most common that almost every second drug and chemical create the problem of DVN i.e. Diarrhea Vomiting and Nausea. Though vomiting was not reported by any of the respondents during the study but diarrhea (35.9%) and nausea (43.2%) was reported by them. Similarly, dizziness was reported by the 24.7% of the respondents whereas feeling weak was reported by 38.5%. About 26.8% of the respondents reported that they had been through the problem of difficulty in seeing whereas eye irritation was reported by majority (63.5%) of the respondents. This might be due to the fact that though some of the respondents didn't cover their eyes while spraying and those who cover their eyes while spraying didn't cover their eye while mixing of pesticides. Thus due to fumes of the pesticides they also had been through the problem of eye irritation (Table 5).

Fever was reported by half (50.3%) of the respondents whereas insomnia was reported by 24.7% of the respondents. Similarly, chest pain was reported by the 25.5%, blisters (60.9%), catarrh (23.4%), body pain (34.4%) whereas, burning sensation was reported by 77.3% of the respondents. From the instant results it can be concluded that majority of the respondents had been through such type of diseases which were directly related with inhalation of pesticides fumes or mist or when these came in contact with the body.

Our results are in similarity with that of Manyilizu *et al.* (2017) who also reported that majority of the respondents had been through diarrhea, burning sensation, itching, eye irritation, dizziness, and chest pain whereas, our results are in contrast with that of the diseases reported by them i.e. forgetfulness and vomiting which was not reported by any respondent in our study. The reason might be due to some of the precautionary measures which they adopted. Our results are also in conformity with that of Jørs *et al.* (2006) and Jensen *et al.* (2011). In these studies, symptoms of acute intoxication (chest pain, excessive

sweating, headache, dizziness and shortness of breath) were reported to have been experienced by farm workers following the routine application of pesticides without proper personal protection. Unsafe practices increase the risk of pesticide exposure, thereby, increasing the risk of clinical and subclinical adverse health effects (Lekei *et al.,* 2016). Mengestie *et al.* (2017) also reported eye irritation and shortness of breath as the most frequent self-reported poisoning cases.

Association among Pictograms and Demographic Attributes

Results in Table 6 show that there was highly significant (P≤0.01) association of all the three activity pictograms i.e. *handle careful liquid product, handle carefully- powder or granules product* and *use a sprayer* pictogram with all the demographic attributes i.e. age, literacy, land holding, involvement in farming and farming experience. Results of gamma test show that all the demographic attributes had positive association with activity pictograms whereas, age, involvement in farming and farming experience the association was negative. This show that with increase of age the respondents were not aware of the activity pictogram which was due to the fact that respondents with high age never used to check the labels (Table 6). Similarly, with increase in farming experience and involvement in farming as full time, the respondents became aware of this pictogram.

Highly significant (P≤0.01) association among use *protective gloves* pictogram with literacy and farming experience was observed. It was also found that the association was positive with literacy and negative with farming experience which might be due to the fact that those respondents who had more farming experience less often used to check the labels. Similarly, *wash after use* had also significant association with age whereas, highly significant (P≤0.01) association was observed with literacy and farming experience. *Wear a mask* pictogram also had highly significant (P≤0.01) association with literacy whereas significant (P≤0.05) association with land holding was observed. Highly significant (P≤0.01) association was observed among w*ear a protective overall* pictogram with literacy and farming experience. Significant association (P≤0.05) was observed with age and involvement in farming.

Use a shield pictogram had also highly significant (P≤0.01) association with age, literacy, and farming experience whereas, significant (P≤0.05) association with landholding. Highly significant (P≤0.01) association was also observed among w*ear a boots* pictogram and literacy whereas significant association (P≤0.05) was observed with age and landholding. *Wear a respirator* pictogram had also a highly significant (P≤0.01) association with literacy and farming experience whereas significant association (P≤0.05) was observed with age. Highly significant (P≤0.05) association was observed among w*ear protective* clothing with age and farming experience whereas, significant (P≤0.05) association was observed with literacy.

Chi-square results in Table 6 depeict that there was highly significant (P≤0.01) association of *dangerous for livestock & poultry* with literacy and farming experience. Significant association (P≤0.05) was observed with landholding. Similarly, *dangerous for wildlife* pictogram had highly significant (P≤0.01) association with literacy and farming experience whereas, significant association (P≤0.05) with involvement in farming was found. *Dangerous for fish do not contaminates water* had highly significant (P≤0.01) association with literacy and farming experience whereas significant association (P≤0.01) was observed with age and land holding. Moreover, k*eep locked away or out of reach from children* pictogram had highly significant (P≤0.01) association with literacy and farming experience whereas, significant association (P≤0.05) was observed with landholding. *Poison* pictogram had highly significant (P≤0.01) association with farming experience whereas, significant association with age, literacy and landholding. Corrosive pictogram had also highly significant (P≤0.01) association with the farming experience whereas significant (P≤0.05) association was observed with age, literacy and landholding.

Flammable pictogram had highly significant (P≤0.01) association with literacy and farming experience whereas, age and landholding had significant association (P≤0.05). *Explosive* pictogram had highly significant (P≤0.01) association with the literacy and farming experience whereas, significant (P≤0.05) association was observed with involvement in farming.

Results in Table 6 also showed that all the toxicity levels pictorgram had highly significant (P≤0.01) association with literacy. Similarly, only non-significant association of age was observed with *moderate hazard* pictogram. Landholding had non-significant association with all the toxicity levels pictograms whereas only *highly hazard* pictogram had significant (P≤0.05) association with involvement in farming. Similarly, highly significant (P≤0.01) association of age with *moderately toxic* and *slightly toxic* Pictogram whereas, significant (P≤0.05) association was observed with *highly toxic* pictogram. It was also found that there was highly significant (P≤0.01) association with literacy and *extremely toxic* pictogram whereas significant (P≤0.05) association was observed with all other pictograms. Similarly, highly significant (P≤0.01) association was observed among *extremely toxic* & *slightly toxic* with landholding whereas significant (P≤0.05) association was observed with *moderately toxic* pictogram. Significant association (P≤0.05) was observed among involvement in farming and *extremely toxic* pictogram whereas, highly significant (P≤0.01) association was observed with *slightly toxic* pictogram.

Following the instructions of labels

Only checking label is of no use if it is not followed while pesticides utilization. The instructions are very important to be followed because every pesticide belongs to different Class of toxicity and required dealing accordingly. Some may be too dangerous while other may require different sort of handling i.e. Granules, Emulsifiable concentrate, wet able powders etc. Similarly on each pesticides container there is always mentioned what protective measures you should take prior to its utilization for safe use. Results in Table 7 showed that majority (58.3%) of the respondents reported that they follow the instructions of labels whereas 41.7% of the respondents never use to follow the instructions.

This might be due to the fact that either respondents were unable to purchase the safety equipment which is mentioned on the labels or they took the labels as light instead of strictly following. Our results are in contrast with that of Devi (2009) who reported that overwhelming majority (97%) of the respondents didn't follow the instructions of labels. It is worth mentioning that among those who use to check the labels, 224 respondents followed somehow the instructions on labels if not all.

Association among self-reported acute poisoning and following labels instructions

Results in Table 8 show that there was highly significant (P≤0.01) association among sneezing, cough, nausea, eye irritation, shortness of breath and body pain with the following instruction on label variable. The association was negative because the gamma value was negative as showed in Table 8. This showed that following up instructions had minimized the acute poisoning cases. Similarly, significant (P≤0.05) association was observed among excessive sweating, stomach ache, dizziness, blisters, catarrh and burning sensation with the following instructions as mentioned on labels. All the other self-reported poisoning cases had non-significant association with the following instructions.

Conclusion

From the present study, it can be concluded that the farmers were not fully motivated towards utilization of personal protective equipment for the utilization of pesticides and thus majority of the respondents been suffered from acute poisoning cases.

The reason behind the acute poisoning cases is the entrance of pesticides contents during ill pesticides practices. The reason of non-utilization of personal protective equipment might also be the non-

understanding of the pictograms and the toxicity level of pesticides thus, the soft and hard pesticides both were handled equally by the farmers and been suffered from the acute poisoning.

It is also concluded from the present study that following instruction can significantly decreases the poisoning cases thus it is suggested that he farmers need to be trained and well aware about the understanding the labels, and performing practical demonstration of proper and safe pesticides application by the Agriculture Extension Department.

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References

Anwar T. 2008. Pesticide Residues in Water, Soil, Fruits and Vegetables in Cotton Growing Areas of Sindh and Lower Punjab (PhD Thesis), University of Karachi, Karachi, p 4-89.

Cronbach LJ. 1951. Coefficient Alpha and the Internal Structure of Tests. Psychometrika. **16(3),** 297–334.

Ecobichon DJ. 2001. Pesticide Use in Developing Countries. Toxicology **160,** 27-33. http://dx.doi.org/10.1016/s0300-483x(00)00.452-2

Giri YP, Maharjan1 R, Sporleder M, Kroschel J. 2009. Pesticide use practices and awareness among potato growers inNepal. 15th Triennial ISTRC Symposium, p 34-43.

Henry L. 2003. Levels of Some Pesticides in Environmental Samples from Southern Lake Victoria and Its Catchments and Their Chemodynamics in Tilapia Species, Water and Sediments under Experimental Conditions. PhD Thesis, University of Dar es Salaam P 1-60. http://dx.doi.org//10.4314/Tjs.V29i1.183.68

Huang J, Qiao F, Zhang L, Rozelle S. 2000. Farm Pesticide, Rice Production and Human Health (Research Reports). International Development Research Centre Ottawa, Canada.

Jensen HK, Konradsen F, Jors E, Petersen Dalsgaard A. 2011. Pesticide use and self-reported symptoms of acute pesticide poisoning among aquatic farmers in Phnom Penh, Cambodia. Journal of Toxicology **7(3),** 1-8. http://dx.doi.org/10.1155/2011/639814

Jørs E, Morant RC, Aguilar GC, Huici O, Lander F, Bælum J, Konradsen F. 2006. Occupational Pesticide Intoxications among Farmers in Bolivia: A Cross-Sectional Study. Environmental Health **5,** p 10. http://dx.doi.org/10.1186/1476-069X-5.10

Kasely DJ, Kumar K. 1989. The Collection, Analysis and Use of Monitoring and Evaluation data. The World Bank, IFAD, FAO London: John Hophkins University Press.

Khan MS, Shah MM, Mahmood Q, Hassan A, Akbar K. 2011. Assessment of Pesticide Residues on Selected Vegetables of Pakistan. Journal of Chemical Society of Pakistan **33(6),** 816-821.

Larrea L, Perchet C, Creac'h C, Convers P, Peyron R, Laurent B, Mauguiere F, Magnin M. 2010. Operculo-Insular Pain (Parasylvian Pain): A Distinct Central Pain Syndrome Brain **133(9),** 2528-39. http://dx.doi.org/10.1093/brain/awq220

Lekei E, Ngowi AV, London L. 2016. Under Reporting of Acute Pesticide Poisoning in Tanzania: Modelling Results from Two Cross-Sectional Studies. Environmental Health **15,** p 118.

McCauley L, Beltran M, Phillips J, Lasarev M, Sticker D. 2001. The Oregon Migrant Farm Workers Community: An Evolving Model for Participatory Research. Environ Health Perspective **109,** 449-455.

http://dx.doi.org/10.1289/ehp.01109s3449

Mengistie AP, Mol J, Oosterveer P. 2017. Pesticide use Practices among Smallholder Vegetable Farmers in Ethiopian Central Rift Valley. Environmental Sustainable Development **19,** 301–324. http://dx.doi.org/10.1007/s10668-015-9728-9.

Menzler-Hokkanen I. 2006. Socioeconomic Significance of Biological Control. In: Eilenberg, (Eds.) Ecological and Societal Approach to Biological Control, p 13-25. ISBN 1-4020- 4320-1(H).

Quandt SA, Arcury TA, Rao P, Snively BM, Camann DE. 2004. Agricultural and Residential Pesticides In Wipe Samples From Farmworker Family Residences In North Carolina and Virginia. Environ. Health Perspective **112,** 382-387.

Sainju R. 2015. Farmers Knowledge, Practices and Perceived Health Symptoms Associated with Pesticides used in Thimi, Bhaktapur, Nepal. International Journal of Medicine & Biomedical Sciences **1(1),** 23-27.

Saleh A, Neiroukh F, Ayyash O, Gasteyer S. 1995. Pesticide Usage in the West Bank. Applied Research Institute -Jerusalem (ARIJ).

Sharma D, Pakade YB, Katnoria JK, Nagpal A. 2010. Analytical Methods for Estimation of Organophosphorus Pesticide Residues in Fruits and Vegetables, Talanta **82,** 1077-1089.

Tariq MI, Afzal S, Hussain I, Sultana N. 2007. Pesticide Exposure in Pakistan: A Review. Environment International **33(8),** 1107-1122.