

Use of Pesticides and Health Risk among Farmers in Sunsari District, Nepal

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ABSTRACT

Background: An increasing widespread use of Pesticides is as an issue in the agricultural sector. Pesticides use is one of the occupational risks in farmers of low-income countries including Nepal. Objective of this study was to explore the health effects of Pesticides among agricultural farmers of Sunsari.

Methods: A community based cross sectional study was carried out in Duhabi-Bhaluwa of Sunsari District, Nepal from September 2015 to February 2016. Non-probability sampling technique was used to enroll the total 300 study participants. Data were collected by face to face interview with farmers using pre-tested semi structured questionnaire. Data were recorded by reading the original container of the Pesticides.

Results: Fungicides (60.3%), Herbicides (56.3%), pyrethrum (35.3%) and Organophosphate (11.6%) Pesticides were commonly used by the agricultural farmers in their farms. The health problem within 48 hours after application of pesticides was reported by more than one-sixth (17%) of the farmers. Dizziness (74.5%) and headache (58.8%) were the most common health problems found among the farmers. Skin irritation (19.6%), nausea (13.7%), paraesthesia (9.8%), restlessness (5.8%), eye irritation (5.8%) and vomiting (1.9%) were also reported by pesticides handlers. Factors associated with health problems were hazardous pesticides use (AOR=26.95, CI 6.15 - 118.0), good knowledge on impacts of pesticides (AOR=3.16, CI 1.09-9.13), determination of wind direction first and spray (AOR=2.25, CI 1.08-4.67), working experience of 20-29 years on farm (AOR=3.38, CI 1.05-10.83).

Conclusions: One-sixth of the farmers reported health problems. Farmers working with hazardous Pesticides were in need of special attention in terms of safe handling, determining the wind direction and spray.

Keywords: Farmer; health hazardous; health risk; pesticides use.

INTRODUCTION

Acute and chronic health effects are resulted due to exposure of pesticides; the acute poisoning has found a most recognized form of effects.¹ About 25 million cases of mild pesticides poisoning occur annually among agricultural workers in developing regions of Asia.² Developing countries are using about 20% of pesticides and this use of pesticides is in increasing trend.³

In Nepal, the establishment of Department of Agriculture was in 1952 AD and after onwards the use of pesticides for crop protection has increased steadily in Nepal.⁴ More than 66 % of Nepalese are working in the agricultural sector. Pesticides use has increases

tremendous manner in the last 5 decades to increase the agricultural production where highly toxic pesticides increase the risk among farmers in low income countries including Nepal.⁵ The objective of this study was to reveal the health effects among agricultural farmers and associated factors with the health problems.

METHODS

We designed a community-based cross-sectional study to enroll the farmers of Duhabi-Bhaluwa municipality of Sunsari district, who handled pesticides in their farms. The study was conducted from September 2015 to February 2016. Ethical clearance was taken from Institutional Review Committee (IRC) of B.P. Koirala

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Institute of Health Sciences. Farmers with age of 20 years and above male or female and who handled the Pesticides either his or her own or in the cultivated land of others were included in the study. Total 300 participants were included based on a calculation of sample size with the reference of the prevalence of skin problems (26.6%) among the vegetable farmers of Bhaktapur,⁶ considering 95% confidence interval, 20% permissible error and 10% non-response rate. Participants of the study were the farmers who handled pesticides and residing in places other than that of bazaar (market) area. Random walk technique enrolled 30 study subjects from each of 1, 2, 3, 4, 5, 10, 11, 12, 13 and 14 wards. At first, irrigation canal (running north to south direction) to the ward number one was identified and the right direction of the canal was followed to enroll the study subject from the ward. The study participants from other wards were enrolled by a similar approach. Informed consent was taken from the participants prior to enrolling in the study. Data were collected by face to face interview method on the door to door visit using semi-structured pretested questionnaire (demographic characteristics, pesticides, knowledge on health impacts of pesticides, safety precautions, health effects of Pesticides). Data related to the pesticides used in the crops were collected by reading the original containers of the pesticides. Pretesting of questionnaire was done by taking 30 farmers (10% of total sample of the study) by using non probability sampling technique in Samariya VDC which is nearby the study site. Cronbach's Alpha of 'knowledge of health impacts of pesticides' was found to be 0.78. Data were coded and entered into Excel sheet. Statistical Package for Social Science (SPSS) 16.version was used for data analysis to work out frequency, percent, mean, standard deviation, Chi-square test and binary logistic regression. Knowledge on the impact of pesticides consisting of eight questions each question full marks was one and the participants scoring <4 the mean score value out of eight questions was taken as poor knowledge and participants scoring ≥ 4 marks was taken as good knowledge. In this study, farmers are those who own their lands and handle the pesticides or that who own others land and handles the pesticides. Health risk of pesticides was the health effect experienced by a farmer who handled pesticides. Health effect included health problems of pesticides handlers within 48 hours of pesticides application in the farm.

RESULTS

Mean age of the participants was 45.01 years, the standard deviation of 12.38 years, ranging from 20 years to 75 years. More than half (54%) of the participants

were in age group 40-59 years. The majority (80.3%) of the participants were males. Majority 87 % of the participants were literate. Forty three percent participants were living in a nuclear family. One fourth of the participants had poor knowledge on health impacts of pesticides. Only 9% of the participants were trained on safe handling of pesticides. About 30% of the participants had 20-29 years of working experience on farm. Five to nine times pesticide spraying in a year were done by 35.4% of the participants. Similarly, 71.7 % of the participants used to determine wind direction first and spray the pesticides (Table 1).

Table 1. Characteristics of the participants (n=300).

Characteristics	Categories	No.	Percent (%)
Age of the participants (year)	20-29	29	9.7
	30-39	63	21.0
	40-49	87	29.0
	50-59	75	25.0
	≥ 60	46	15.3
Gender	Male	241	80.3
	Female	59	19.7
Education status	Illiterate	39	13.0
	Literate	261	87.0
Types of family	Nuclear Family	129	43.0
	Joint Family	171	57.0
Knowledge on health impacts of Pesticides	Poor Knowledge	75	25.0
	Good Knowledge	225	75.0
Training on safe handling of pesticide	Yes	27	9.0
	No	273	91.0
Years of working experience on farm	1-9	74	24.6
	10-19	84	28.0
	20-29	90	30.0
	≥ 30	52	17.4
No. of spraying time in a year	<5	170	56.6
	5-9	106	35.4
	>10	24	8.0
Determine wind direction first and spray	Yes	215	71.7
	No	85	28.3

According to WHO classification of Pesticides, 7% of the farmers were using highly hazardous Pesticides, 15% farmers were using moderately hazardous Pesticides, 28% farmers were using slightly hazardous Pesticides,

where as 86.6% were using Pesticides unlikely to present acute hazard. Based on chemical type of pesticide, Fungicide, herbicide, pyrethrum and organophosphate were commonly used pesticides i.e 60.3%, 56.3 %, 39.3% and 11.6% respectively (Table 2).

Table 2. Use of Pesticides (n=300).

Characteristics	Categories	No.	Percent (%)
WHO Classification of Pesticides*	Class Ib (Highly hazardous)	21	7.0
	Class II (Moderately hazardous)	45	15.0
	Class III (Slightly hazardous)	84	28.0
	U (Unlikely to present acute hazard)	260	86.6
Chemical Types of Pesticides*	Fungicide	181	60.3
	Herbicide	169	56.3
	Pyrethrum	106	35.3
	Organophosphate	35	11.6
	Carbamate	4	1.3
	Fungicide+ Bactericide	4	1.3
	Organophosphate + Pyrethroids	2	2.0
	Organ chlorine	1	0.6

*=Multiple Response

Seventeen percent participants had health problems within 48 hours of pesticides application. Dizziness and headache were the most common health problem seen among 74.5% and 58.8% of the participants respectively (Table 3).

Table 3. Health problems of agricultural farmers within 48 hours of pesticides application (n=300).

Health problems	Number	Percent
Yes	51	17
No	249	83
Health problems*	Number (n=51)	Percent
Dizziness	38	74.5
Headache	30	58.8
Skin irritation	10	19.6
Nausea	7	13.7
Paraesthesia	5	9.8
Restlessness	3	5.8
Eye pain	3	5.8
Vomiting	1	1.9

*Multiple Responses

Chi-square (χ^2) test was used to show the factors associated with health effects among the agricultural farmers. The significantly associated factors such as types of pesticides used, knowledge on health impacts of pesticides, determination of wind direction first and spray, work experience on farm and number of spraying times in a year were taken in to multivariate analysis. Binary logistic regression was used to find the AOR, confidence interval (CI) 95%. Types of pesticides use and health problem were found highly significant. As a reference to farmers using pesticides unlikely to present an acute hazard, using hazardous pesticides was 26.95 times more likely to report health problems. Reference to poor knowledge on impacts of pesticides among farmers having good knowledge on health impacts of pesticides was 3.38 times more likely to report health problems. Reference to determination of wind direction first and spray, without determination of wind direction first and spray were 2.25 times more likely to report health problems. Years of working experience on farm and health problems were also associated. As a reference to one to nine years of working experience on the farm, 20-29 years of experience on the farm were 3.38 times more likely to report health problems (Table 4).

Table 4. Factors associated with health problem of farmers after binary logistic regression.

Characteristics	B	AOR	95% of C.I.
Types of pesticides			
Hazardous*	3.294	26.946	6.153 - 118.001
Unlikely to present acute hazard (Ref.)			
Knowledge on health impacts of pesticides			
Poor knowledge (Ref.)			
Good knowledge	1.153	3.168	1.098 - 9.137
Determination of wind direction first and spray			
Yes (Ref.)			
No	0.814	2.256	1.089-4.674
Years of working experience on farm			
1-9 Years (Ref.)			
10-19 Years	.200	1.221	0.316 - 4.718
20-29 Years	1.218	3.381	1.055 - 10.838
≥30 Years	.920	2.509	.805 - 7.817
*Hazardous includes highly hazardous, moderately hazardous and slightly hazardous pesticides			

DISCUSSION

This study revealed that, 17% farmers had health problems within 48 hours of pesticides application within a past one year, which is similar to study done among agricultural farmers of Jamaica which was 16 percent.⁷

Among who had health problems, dizziness and headache were the most common health problem seen among the participants 74.5% and 58.8% respectively. These health problems were similar to study done among farmers in a rural district of West Bengal, India and farmers in North Gaza, Palestine.^{8,9} Skin irritation (19.6%) found in the study was less than that of study done among vegetables farmers (26%) of Bhaktapur, Nepal,⁶ and the difference might be due to the difference in targeted farm and choice of pesticides use, and precaution taken while spraying pesticides. There are literatures describing ill effects due to pesticides.¹⁰⁻¹³ The adverse effects of Pesticides poisoning depend on compound, dosage and exposure time.¹⁴ The types of pesticides use and health problem was found to be statistically highly significant after binary logistic regression. Reference to the farmers using pesticides of unlikely to present acute hazard category, the group of farmers who applied hazardous pesticides was 27 times more likely to report health problems. Similar association was shown in a study done among farmers of Uganda.¹⁵ Reference to the farmers with poor knowledge on impacts of pesticides, the group of farmer having good knowledge on health impacts of pesticides was 3 times more likely to report health problems. The farmers might have been aware of Pesticides after getting ill. The farmers who did not determine the direction of wind during spray were two times more likely to report health problems than that of who determined the wind direction. This finding was similar to a study done among male farmers in South Korea.¹⁶ The farmers with experience on farm for 20 to 29 years were three times more likely to report health problems than the farmers with 1 to 9 years of experience on farm, which was similar to a study done among farmers in northwestern Jamaica.¹⁷ This finding contradicted to other studies among farmers where younger and less experienced farmers were having health problems of poisoning.^{18,19} Though there was association between number of times of pesticides spray within a year and health problems in bivariate analysis, after binary logistic regression, the association was not found between numbers of times of pesticides spray within a year and health problems, as was shown in a study done among farmers of Uganda.¹⁵

This study was limited to the farmers engaged in agricultural field of Duhabi-Bhaluwa and reported health problem within 48 hours after application of the pesticides. This study did not explore the health problems of the farmers before the application of the pesticides. This study could not ignore presence of recall bias.

CONCLUSIONS

About one-sixth of farmers, pesticides handlers, reported that they suffered from the health problems within forty-eight hours of pesticides application in farms. Dizziness and headache were the most common health problems. Using hazardous pesticides had increased the risk of health problem among the farmers. Most farmers with good knowledge on health impact of pesticides were the farmers suffering from health problems. Determination of wind direction to spray pesticides could reduce health problems among the farmers. Farmers working with hazardous Pesticides were in need of special attention in terms of safe handling by determining the wind direction and spray. Further investigation including laboratory investigations could reveal the specific health problems of pesticides handler.

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