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Original Article

Knowledge, attitude, and practice of pesticide use among agricultural workers of Lamatar, Lalitpur, Nepal

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ABSTRACT

Introduction: In this fast-developing world, food production has also been changing, making people suffer from various health issues because of pesticide poisoning. Unsafe methods in handling pesticides, especially in middle and low-income countries like Nepal are still practiced, although the deleterious health effects either go unnoticed or are missed or are diagnosed late. Few of the older less costly pesticides remain for years in soil and water although few of them have been banned they are still available in many developing countries. The study aimed to assess knowledge, attitude, and practice regarding pesticide use among agricultural workers and farmers' awareness of pesticide labels on pesticide bottles or packets.

Methods: A cross-sectional study among 74 conveniently selected agricultural workers, who used or ever-used pesticides within the last six months was conducted in Lamatar Village Development Committee, Lalitpur District from January 2022 to February 2022. Ethical clearance was obtained from the Institutional Review Committee of Kathmandu Medical College. The questionnaire was adapted from literature about personal protective equipment with some modifications according to the local context. Data was collected through a face-to-face interview.

Results: Among the total 74 respondents 49 (66.2%) were females and only 25 (33.8%) were males. Most of them had no formal education but could read and write. However, less than half 32 (43.2%) had adequate knowledge while the majority 49 (66.2%) had a negative attitude towards the use of pesticides. However, only 32 (43.2%) had good practice handling pesticides and its effect.

Conclusion: This study showed low knowledge regarding pesticides, their health effects, and poor practice however, a negative attitude towards the use of pesticides. But pesticide is still widely used because of the demand for more earnings. So, we would recommend that there is a need for time-to-time regular community-based training regarding how to safely handle pesticides and the availability of less harmful fertilizers products at retailers or consultancies.

Keywords: Attitude, Farmer, Knowledge, Pesticides, Practice.

Introduction

In Nepal, one-third of the nation's Gross Domestic Product is contributed to agriculture sectors and engages around 66% of the total Nepalese population with a significant contribution to national economic growth.[1] In this fast-developing world, food production has also been changing making suffer from various health effects because of pesticide poisoning, according to World Health Organization (WHO), 500,000–1,000,000 people per year are affected.[2]

A study from India shows 70% of respondents knew about pesticide affects health, however, only 40% were aware that it also affects the environment. The respondent's awareness of modes of entry was less as only 42% knew about it. Among them, 70% of respondents have not used any protective equipment during pesticide spraying.[3]

In many developing countries and some

developed countries still, unsafe methods of handling pesticides are practiced especially in middle and low-income countries like Nepal, although the deleterious health effects either go unnoticed and are missed or are diagnosed late.[4] Thus, understanding farmers' knowledge of pesticides and safety practices is vital to provide valuable information aimed at preventing or reducing the health and environmental hazards associated with pesticides.[4]

Few of the older less costly pesticides remain for years in soil and water although few of them have been banned. However, few are still available in many developing countries as pesticides play a significant role in food production through protection or increased yields and also to increase the frequency of production on the same land.[5,6] The person most at risk is those who are directly exposed (including agricultural workers who apply pesticides and anyone else in the immediate area during, and shortly after pesticides are spread). More than 1000 pesticides are used around the world to ensure food is not damaged or destroyed by pests and each of them has different properties and toxicological effects.[5,6]

Pesticides such as dichlorodiphenyl-trichloroethane (DDT) and lindane, are older as well as less costly and can remain for years in soil and water. This is the reason WHO has two aims firstly to ban the pesticides that are most toxic to humans, as well as pesticides that remain for the longest time in the environment; and secondly to protect public health by setting maximum limits for pesticide residues in food and water.[6]

Pesticides are chemicals used to control any organism that might invade or damage crops, food stores, or homes. Pesticides in either of its form whether insecticides or herbicides or rodenticides or fungicides are used for protecting harvested crops and seeds from fungal rot.[7] The practices of pesticide handling and farmers' cognizance about pesticide use and overuse also play a vitally important role in safe spraying.[8,9,10] So, the study aims to find knowledge, attitude, and practice of pesticide use among agricultural workers and also to assess the awareness of farmers about pesticides label on pesticide bottles or packets.

Methods

A community-based cross-sectional study was conducted between January 2022 to February 2022 in Lamatar Village Development Committee, Lalitpur District, Nepal. Ethical approval was taken from the Institutional Review Committee (IRC) of Kathmandu Medical College. All the participants were informed in detail about the study and written consent was taken. The inclusion criteria were both men and women who had been working as farmers for at least 6 months and were exposed to pesticides for at least 6 months. Exclusion criteria were those involved in other professions and those who did not give consent.

Sample size formula: $n= Z^2.p.q/e^2$

p = Prevalence (not wearing any protective clothing during spraying pesticides) =0.26 [10]

q = 1-p = 0.74

e = Allowable error i.e. 10%

So, the total sample size (n) = 74

Convenient sampling was taken and we took data from all the available farmers present at the time of data collection.

Data was collected using a questionnaire through face-to-face interviews. The questionnaire preparation was based on literature about the use of personal protective equipment with some modifications according to the local context. The questionnaire was divided into 5 parts, with questions on demographic information, knowledge, attitude, the actual use of personal protective equipment (PPE) during spraying, and awareness of farmers about pesticide labels on pesticide bottles or packets.

The collected data was entered and statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 21. Descriptive statistical tools like frequency, percentage, median, and interquartile range were used to express the results.

To test the variable's distribution, a test of the normality of the data was performed. The data was considered as not normally distributed if the significance of the Shapiro-Wilk test was < 0.05. Pearson chi-square test was used for bivariate analysis to determine the presence of an association between the dependent and independent variables. All tests were done with a significance level of 5% (p-value <0.05).

Results

There was a total of 74 participants, among them more than two-thirds 49 (66.2%) were females and 25 (33.8%) were males. The majority of the respondents belonged to the age group of 35-44 years (31.1%). The age range of participants was 23 to 77 years with a median age of 45 years and an interquartile range of 20 years, respectively. The majority of the respondents were Hindu 72 (97.3%) and only two (2.75%) were Buddhist by religion. The Brahmin was highest 37 (50%) by ethnicity followed by Janajati 27 (36.5%), Madhesi 5 (6.8%), Chhetri 4 (5.4%), and 1(1.4%) person did not know his/her ethnicity. Most of them 23 (31.1%) had no formal schooling but could read and write. The agriculture/farmer was 70 (94.6%) by occupation while 2 (2.7%) were homemakers and 1(1.4%) person was private and 1(1.4%) was a government service worker in our study as we took convenient sampling.

Regarding the pesticide information, 57 (77%) of respondents had known from retailers while 14 (18.9%) from consultancies, and only 3 (4.1%) came to know from co-farmers. About new pesticides respondents had known from 45 (60.8%) retailers followed by co-farmers 22 (29.8%), and consultancies 7 (9.5%). Half of the respondents mixed powder and liquid pesticides with bare hands 37 (50.0%) followed by using sticks 28 (37.8%) and 9 (12.2%) respondents used other methods sometimes using clothes sticks or plastic etc.

Among the respondents, 34 (45.9%) stored their pesticides in a store room within the house and 31 (41.9%) stored them outside the house and 9 (12.2%) on the roof. More than half 41(55.4%) did not know the mode of contact with pesticides in their body parts however, 32 (43.2%) of them knew about it. About 71 (95.9%) of respondents disposed of containers of powder or liquid pesticides by throwing them in a dustbin and 3 (4.1%) of them throw them in an open field. However, the majority of 68 (91.9%) respondents reused the sack/container of solid pesticides by washing it and 6 (8.1%) threw it.

The majority of the respondents washed the pesticide equipment 47(63.5%) at nearby water sources, 12(16.2%) outside the home and 15(20.3%) at home. According to them 54(73%) thought pesticides were harmful to the soil as well as human health, and only 20(27%) thought it was not harmful. However, if they had any health issues or effects of pesticides, the majority 42(56.8%) had consulted with a doctor, 27(36.5%) had consulted with a healthcare worker and 3(4.1%) had treated with home remedies and 2(2.7%) of them ignore. The attitude of the respondents on pesticide use was evaluated by using a 5-point Likert scale consisting of nine mixed types of questions (Table 1).

Table 1: Attitude response of respondents (n=74)

Statements	Strongly disagree (%)	Disagree (%)	Neither agree nor disagree (%)	Agree (%)	Strongly agree (%)
Personal Protective Equipment (PPE) is not required when pesticides are used in a little amount	18 (24.3)	44 (59.5)	6 (8.1)	4 (5.4)	2 (2.7)
Good-quality pesticides are not dangerous	0 (0)	5 (6.8)	40 (54.1)	28 (37.8)	1 (1.4)
Using pesticides is essential for more production	1 (1.4)	4 (5.4)	8 (10.8)	45 (60.8)	16 (21.6)
After pesticides exposure bathing is not required nor changing clothes	1 (1.4)	31 (41.9)	13 (17.6)	28 (37.8)	1 (1.4)
PPE is important to prevent the body from pesticide poisoning	0 (0)	1 (1.4)	9 (12.2)	25 (33.8)	39 (52.7)
Bathing immediately after using pesticides decreases poisoning	0 (0)	1 (1.4)	18 (24.3)	47 (63.5)	8 (10.8)

Using pesticides during smoking increases inhalation of pesticides	0 (0)	2 (2.7)	18 (24.3)	38 (51.4)	16 (21.6)
During the use of pesticides, drinking and eating will have no problem	12 (16.2)	37 (50.0)	14 (18.9)	8 (10.8)	3 (4.1)
Using PPE is uncomfortable when I am using pesticides	1 (1.4)	21 (28.4)	34 (45.9)	16 (21.6)	2 (2.7)

Table 2: Practice among respondents (n=74)

Statements	Always (%)	Sometimes (%)	Never (%)
Use a sprayer while using the mixture of powder and liquid pesticide	44 (59.5)	9 (12.2)	21 (28.4)
When the sprayer nozzle is blocked do you clean it with the mouth	20 (27)	11 (14.9)	43 (58.1)
Immediately after spraying and dispersing pesticides take a bath	24 (32.4)	23 (31.1)	27 (36.5)
Wear a hat while spraying	41 (55.4)	6 (8.1)	27 (36.5)
I don't smoke or eat or drink	27 (36.5)	6 (8.1)	41 (55.4)
I wear glasses when spraying liquid pesticides	5 (6.8)	5 (6.8)	64 (86.5)
I wear boots when spraying liquid, powder and solid pesticides	23 (31.1)	8 (10.8)	43 (58.1)
I wear long sleeve clothes, long gloves and a mask when spraying the pesticides	38 (51.4)	15 (20.3)	21 (28.4)
I wash my hands and change clothes after using pesticides	41 (55.4)	27 (36.5)	6 (8.1)

The practice of respondents is illustrated above (Table 2).For cultivating crops for respondents' own families, they preferred the use of botanical pesticides 56 (75.7%) and 18 (24.3%) preferred chemical fertilizers. More than half 41(55.4%) did not look for the danger sign of pesticides however only 33(44.6%) looked for danger signs on pesticides. Pesticide color code toxicity and the label was also ignored by more than half 42(56.8%), and an equal number of them did not look for the expiry date and read the manufacture date. Though, 32 (43.2%) looked at the danger signs and read the manufacturer and expiry date. Among respondents, 38 (51.4%) followed careful safe titer and correct dosage whereas, 36(48.6%) did not follow.

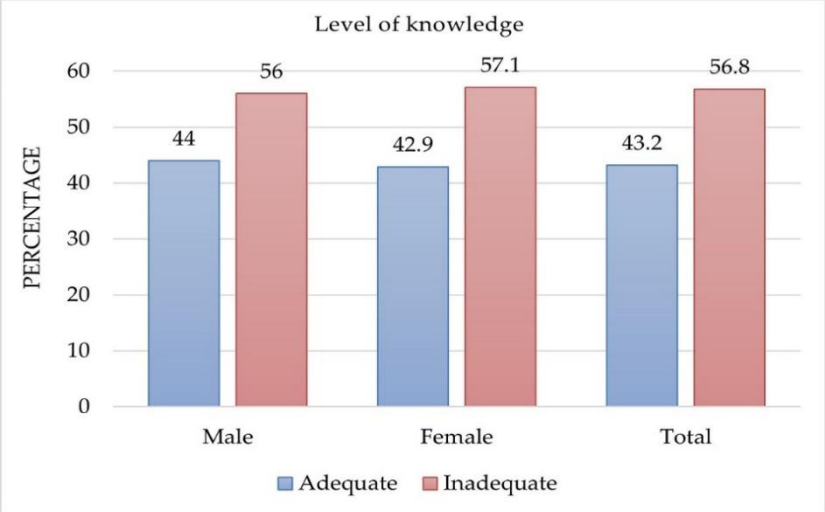

Figure 1: Knowledge level of the respondents

The final score on knowledge was calculated according to the score obtained in fourteen different aspects of pesticides. The respondents' knowledge was classified into either adequate (above the median) or inadequate (below or equal to the median) based on the median score. Out of the total respondents, nearly 32(43.2%) had adequate knowledge whereas, 42(56.8%) had inadequate knowledge. Out of 25 males, 11(44%) had adequate knowledge and 14(56%) had inadequate knowledge. Among 49 females, 21(42.9%) had adequate knowledge and 28(57.1%) had inadequate knowledge (Figure 1).

According to the respondents' scores on each statement of attitude, the final scores were calculated. The respondents were then classified into either having a positive attitude (above the median) or a negative attitude (below or equal to the median) based on the median score. Out of the total respondents, the vast majority 49 (66.2%) had a negative attitude while the remaining 25 (33.8%) had a positive attitude. Out of 25 males, 8 (32%) had a positive attitude and 17 (68%) had a negative attitude. Among 49 females, 17 (34.7%) had a positive attitude and 32 (65.3%) had a negative attitude (Figure 2).

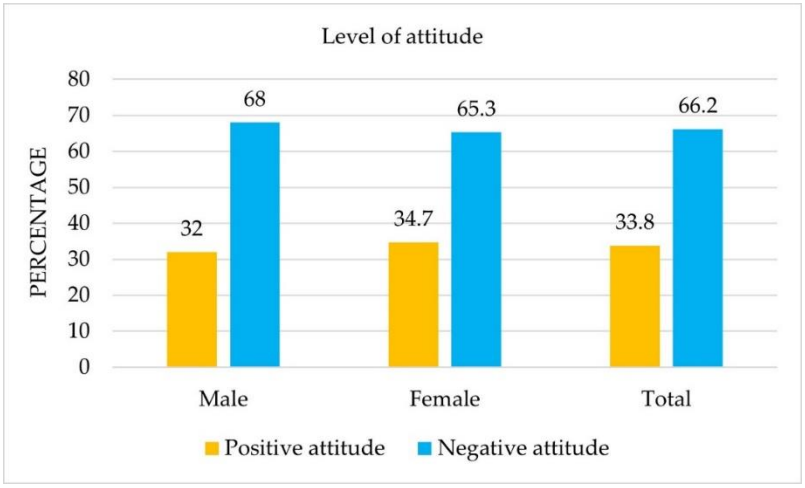

Figure 2: Attitude level of the respondents

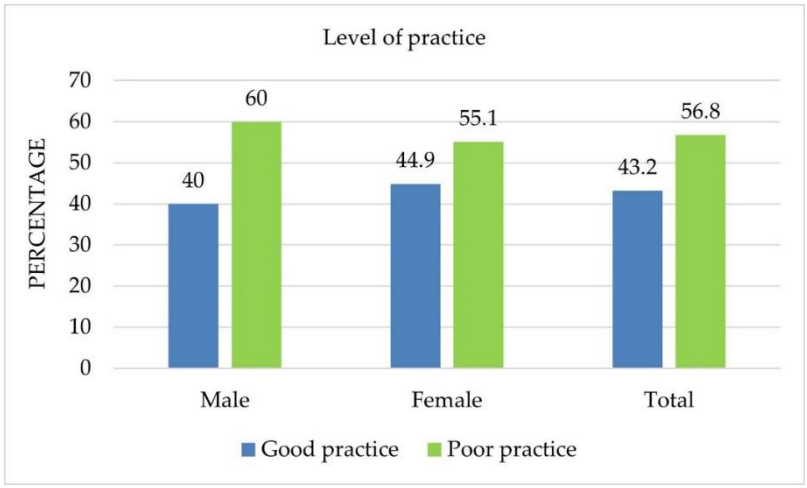

Figure 3: The practice level of the respondents

According to the score obtained in ten different aspects of pesticides, the final score on practice was calculated. The level of practice of the respondents was classified into either good (above median) or poor (below or equal to the median) based on the median score. Out of the total respondents, nearly 32 (43.2%) had good practice while 42 (56.8%) had poor practice. Out of 25 males, 10 (40%) had good practice and 15 (60%) had poor practice. Among 49 females, 22 (44.9%) had good practice and 27 (55.1%) had poor practice (Figure 3).

The chi-square test was applied to test the association between socio-demographic characteristics and respondents' knowledge levels. The test showed a significant difference in respondents' knowledge levels among different age groups (p=0.013). The test showed no significant difference in the knowledge level of respondents among gender, religion, ethnic groups, and education levels (p > 0.05) (Table 3).

Table 3: Socio-demographic characteristics and level of knowledge of respondents (n=74)

Characteristics	Class	Level of knowledge		P value
		Inadequate	Adequate	
Age groups	<35	10(100)	0(0)	0.013
	35-44	11(47.8)	12(52.2)	
	45-54	12(63.2)	7(36.8)	
	55-64	6(54.5)	5(45.5)	
	≥65	3(27.3)	8(72.7)	
Gender	Male	14(56)	11(44)	0.925
	Female	28(57.1)	21(42.9)	
Religion	Hindu	40(55.6)	32(44.4)	0.211
	Buddhist	2(100)	0(0)	
Ethnicity	Janajati	13(48.1)	14(51.9)	0.326
	Madhesi	3(60)	2(40)	
	Brahmin	21(56.8)	16(43.2)	
	Chhetri	4(100)	0(0)	
	Others	1(100)	0(0)	
Education	Illiterate	7(58.3)	5(41.7)	0.396
	No formal schooling but can read and write	10(43.5)	13(56.5)	
	Primary school	5(45.5)	6(54.5)	
	Middle school	6(60)	4(40)	
	High school	7(70)	3(30)	
	Intermediate	5(83.3)	1(16.7)	
	Graduate (Bachelor's) or Postgraduate (Master)	2(100)	0(0)	

Discussion

The consumption of fruits and vegetables is essential for health, as inadequate intake enhances the establishment of risk factors for various non-communicable diseases.[11] Similarly in children, even low-dose exposure to pesticides affects neurological and behavioral development, accidental exposure is associated with cancer, Attention deficit hyperactivity disorder (ADHD), and autism.[7] However, there is wide use of pesticides in developing as well as developed countries.[4] Majority of the farmers in our study were females not in alignment with other studies. The reason is the women were available at their houses and field at the time of study whereas, the males did other work and mostly transported the crops to buyers.[5,8,9,10,12]

The age of farmers was between the age group of 35-40 years and this finding is similar to other studies.[8,9] Most of the farmers in our study were Hindu 72(97.3%) and had no formal education 23(31.1%) and the majority 70(94.6%) are farmer/agricultural workers by occupation, this was similar to other studies.[7,9]

A study by Rijal et al. has reported that information regarding pesticides is obtained from retailers 57(77%).[9] In our study we had a similar finding to a study from India, 32(56%) of farmers had good knowledge regarding pesticides.[10] Mohanty et al. reported respondents were not using any protective equipment during pesticide spraying in our study also only 42(56.8%) were using PPE.[3] Bhandari G study

state higher use of mask, boot, and clothes which is not similar to our finding as in our study only 18(24.3%) were using a mask, 12(16.2%) were using gloves and only 3 (4.1%) used shoes or boot. However, more than half 41(55%) use other methods like clothes on the head which is similar to the report of Mohanty et al., Rijal et al., and Bhandari G.[3,9, 13]

The majority of farmers 34 (45.9%) store pesticides within the house in store similar to the finding by Sachan B et al. and other studies.[8,9,14,15] Maximum of 54 (73%) of farmers accept pesticides are harmful to the soil as well as human health and only 20 (27%) think it is not harmful which is not similar to finding from India.[8]

The farmers agreed 62(83.8%) that personal protective equipment(PPE) is required even if pesticide use is a little similar to the findings by Sai MV et al. [10] and Rostami F et al.[17] However more than half 40(54.1%) of them are not sure whether good quality pesticides are less dangerous or not, this finding is not in alignment with findings from other studies; it could be because of the different settings and knowledge of farmers.[8.10,17] Pesticide use is essential for more production according to respondents as 61(82.4%) agree to it, this is similar with finding from other studies.[8,9] The farmer knew bathing after pesticide exposure as well as changing clothes is necessary.[16] More than half 49(66.2%) of them disagree that drinking and eating during pesticide spraying will not cause any problems.[17] Majority 54(73.3%) of them knew smoking while using pesticides increases its inhalation these are in line with those reported by Rostami F et al. findings.[17]

Most farmers (59.5%) use a sprayer while using a mixture of powder and liquid pesticide and never use a mouth to clean when the nozzle is blocked, this finding is in line with other studies.[17,18] However, many of them 27(36.5%), do not take a bath immediately after spraying and dispersing pesticides nor wear glasses or boots when spraying this is not similar to the finding reported by Rostami et al.[17] The farmer wears a hat or clothes when spraying, and do not smoke or eat or drink, and also puts long sleeves clothes during spraying pesticides, which is in alignment with finding in other studies.[8,9,14,16,17]

The majority of the farmers 69(91.9%) wash their hands with soap and water similar to the study by Bhandari and Zyoud et al.[16,18] For cultivating crops for their own family 56(75.7%) prefer Botanical pesticides.[14] More than half 41 (55.4%) did not look at danger signs or read and follow the pesticide label this finding aligns with other studies.[8,9] Pesticides color code toxicity and label is also ignored by more than half 42(56.8%) similar to the finding by Rijal et al.[9]

Conclusion

This study showed low knowledge regarding pesticides among the respondents and the majority of them were females. Females also had inadequate knowledge about its health effects and poor practice along with a negative attitude towards the use of pesticides, however still widely used because of the demand for more earnings. So, we would recommend that there is a need for time-to-time regular community-based training regarding safely handing pesticides and the availability of less harmful fertilizers products at retailers or consultancies.

Limitations

Since the study is conducted in a single setting the findings cannot be compared with other parts of the country.

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