Annals of Community Health (AoCH) pISSN 2347-5455 | eISSN 2347-5714

An Indexed (Index Medicus, DOAJ and More), Peer Reviewed, Quarterly, International Journal focusing exclusively on Community Medicine and Public Health

ORIGINAL ARTICLE

A Cross-sectional Study to Assess the Knowledge, Attitude, Practices, and Risks Associated with Pesticide Exposure in Farmers of Kodariya Village in Indore District

Bhagwan Waskel[1], Richa Siddharth[1], Lubana Shaikh[1], Salil Sakalle[1], Praveen Yuwane[1], Geeta Shivram[1], Behlool Johar[2], Kunal Bais[2], Kanhaiya Hariyale[2], Laxmi Bhadouriya[2], Juhi Upadhyay[2]

ABSTRACT

Background: Pesticides are widely used in public health to kill vectors of disease and in agricultural farms to kill pests damaging crops. The unsafe and indiscriminate use of pesticides in agriculture results in major environmental and human hazards. The aim of this study was to assess the level of knowledge, attitude, and practices of safe use of pesticides and the risk associated in the farmers of Kodariya village in Indore district. Objective: The objectives are as follows: 1. To study the prevalence of pesticide used in Kodariya village. 2. To assess the knowledge, attitude and practices of farmers regarding pesticide use. 3. To study the harmful effects of pesticides on farmers. **Methodology:** A cross-sectional study was conducted on the farmers of Kodariya village near MHOW. Study was carried out using a pre-designed semi-structured questionnaire which included demographic questions and question related to pesticides knowledge, their use and pesticides harmful effects. Farmers who work on farms currently and those who gave their consent were taken for the study .The study was conducted from September 2019 to January 2020. The consistency and completeness of the collected data were checked manually and then coded, cleaned, and entered using trial version of SPSS 20 software for further analysis. Ethical clearance from the college committee was taken. Written informed consent was taken from the participants. **Results:** Out of 80 farmers interviewed, 67 (83.57%) farmers were using pesticides. Out of which 55 (68.75%) of farmers were aware of the harmful effects of pesticides and 57 (85.08%) farmers were wearing mask, gloves, and shoes while pesticide spraying. Five (50%) farmers had encountered eye irritation as the most common symptom following pesticide use. **Conclusion:** The findings of this study showed that the use of pesticide is widely prevalent in Kodariya village of Indore district. The harmful effects of pesticides can be minimized using personal protection equipment and proper guidance regarding safe pesticides use and safe disposal.

Key words: Organic farming, personal protective equipment, pesticide

INTRODUCTION

Agriculture is an important economic sector in India. Around 58% of the rural households depend on agricultural sector as their principal agency of bread and butter.[1,2]

As per the World Health Organization, 5–10 lakh farmers around the world suffer from health effects due to pesticide poisoning every year.[3] Despite the deleterious effects of pesticides, people continue to use unsafe methods of handling the pesticides in many developing countries and some developed countries. Pests are a cause of serious damage in agricultural field, in terms of yield and expensive chemicals that increase the overall agricultural production budget costing billions of dollars annually. In spite of the

[1]*Department of Community Medicine, M.G.M. Medical College Indore, Madhya Pradesh, India*
[2]*MBBS Prefinal Students, M.G.M. Medical College, Indore, Madhya Pradesh, India*

Correspondence: Dr. Lubana Shaikh, Department of Community Medicine, M.G.M. Medical College, Indore, Madhya Pradesh, India. Phone: +91-8770098820, +91-9713654957. E-mail: lubnashaikh573@gmail.com

How to cite: Waskel B, Siddharth R, Shaikh L, Sakalle S, Yuwane P, Shivram G, Johar B, Bais K, Hariyale K, Bhadouriya L, Upadhyay J. A Cross-sectional Study to Assess the Knowledge, Attitude, Practices, and Risks Associated with Pesticide Exposure in Farmers of Kodariya Village in Indore District. Ann Community Health 2021;9(2):105-110.

high costs, chemical pesticides are preferred for protecting crops against pest damage. On the other hand, pesticide poses a serious danger to human health and environment. With an ever increasing population worldwide, demands for food and energy cannot be ignored as the major portion of available food and energy is produced by agricultural and livestock activities also to attain a sustainable development in the agricultural sector, farmers welfare, and health should be considered and measures are to be taken for protecting their health against occupational hazards.[4] Pesticides cannot selectively activate, that is, in addition to affecting targets and pests, they also have side effects on non-target species (including humans).[5]

Farmers and especially those directly involved in the handling of pesticides, are at a high risk of exposure to pesticides when mixing and applying pesticides or working in treated fields and from residues on food and drinking water. In most cases, farmers face great risk due to the exposure and use of banned toxic chemicals, incorrect pesticide application techniques, inappropriate spraying equipment, improper storage practices, reusing old pesticide containers for food, and inadequate use of personal protection equipment due to lack of knowledge.

The World Health Organization (WHO) supervises the toxicity and safety of pesticides. All pesticide containers must bear warning labels but it has not been noticed due to illiteracy of farmers or lack of proper education. Lack of monitoring of the manufacturing, production, and selling of non-standard pesticides and their high availability in the market results in inappropriate use of pesticides which leads to adverse effects on farmers health and additional effects on environment and public health in the long run.[6]

Hence, the purpose of this study is to know the prevalence of pesticide use, discuss the hazardous effects of chemical pesticides on human health and to assess the knowledge, attitude, and practices regarding safe use of pesticides in the farmers of Kodariya village in Indore district.

METHODOLOGY

A cross-sectional study was conducted on farmers currently working on farms of Kodariya village near MHOW. We took 80 farmers for our study. Study was carried out using a pre-designed semi-structured questionnaire which included demographic questions and question related to pesticides knowledge, their use and pesticides harmful effects. Farmers who work on farms currently and those who gave their consent were taken for the study. Farmers who are not working on their farms currently and those who have not given the consent were taken for the study. The study was conducted from September 2019 to January 2020. The consistency and completeness of the collected data were checked manually and then coded, cleaned, and entered using trial version of SPSS 20 software for further analysis. Ethical clearance from the college committee was taken. Written informed consent was taken from the participants. Descriptive statistics such as frequencies, percentage, proportions, and summary statistics were used to define respondents in relation to pertinent variables and presented using tables.

RESULTS

Table 1 shows that out of 80 farmers of Kodariya village, 41 (51.25%) farmers belong to the age group between 40 and 50 years old.

Table 2 is showing that out of 80 farmers, 67 were using pesticides. Therefore, 83.75% is the prevalence of pesticides use, while only three farmers (3.75%) adopted organic farming.

Figure 1 is showing that "ROKET" is the most commonly used pesticide (64.18%) in Kodariya village used by 43 farmers out of 67 either alone or in combination with other pesticides. The constituent of this pesticide is combination of profenophos (OPP) and (pyrethroid) cypermethrin which is considered harmful.

Table 3 is showing that out of 67 farmers, 33 became aware about the pesticides from their Co farmers (44.7%) and 28 from the Retailers (41.7%). About 32 farmers (47.7%) were using pesticides on their farms since 11–20 years and 24 farmers (35.8%) were using pesticide since 30 years. The pesticide storage practices were quiet variable among the farmers interviewed. Some farmers about 28 (41.7%) were using the pesticide on the same day, while others were storing pesticide for weeks and even months. About 30 farmers (44.7%) interviewed were storing pesticide inside their house, about 26 farmers 38.8% were storing outside the house and the remaining farmers were storing it in their farms. Only ten farmers (14.9%) were using proper air tight containers for pesticide storage and

Table 1: The mean age-group of the farmers involved in the study

Age group	Frequency	Percentage
30–40	15	18.75
40–50	41	51.25
50–60	22	27.5
>60	2	2.5
Total	80	100

Table 2: Methods of farming adopted by farmers of Kodariya village

Variables	Frequency (80)	Percentage 100
Pesticide use	67	83.7
Organic farming	3	3.75

the remaining very large number of farmers was storing the pesticides in normal household containers prone for leakage.

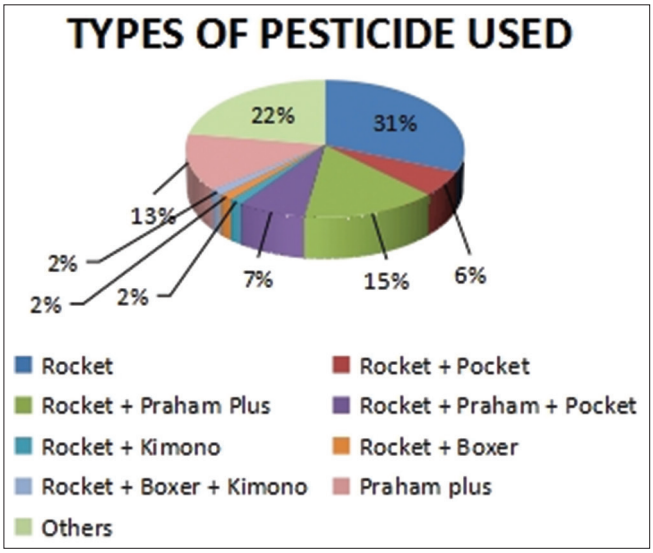

Figure 1: Types of pesticides used in Kodariya Village

Table 3: Farmers knowledge and practices regarding pesticide use

Questions	Variables	Frequency (67)	Percentage (100)
1. What was the source of information of pesticides.	Retailers	28	41.79
	Co-farmers	30	44.77
	Others	9	13.4
2. Since when are you using pesticides	2–10 years	5	7.46
	11–20 years	32	47.76
	21–30 years	24	35.82
	>30 years	6	8.96
3. Where do you store pesticide?	In the farms	11	28.2
	Inside house	30	44.77
	Outside house	26	38.8
4. Duration of pesticide storage	1 week	20	51.28
	2 weeks	11	28.2
	1 month	8	20.52
	Within hours	28	41.7
5. How do you store pesticide	In proper air tight containers	10	14.92
	In Household containers	57	85.08
6. Methods of mixing pesticide with water	Wooden stick	64	95.52
	Bare hands	2	2.98
	Using gloves	1	1.42
7. Protective equipment used while spraying pesticide	Mask, gloves and shoes	57	85.08
	No protection	10	14.92
8. Disposal of pesticide container	Sell it	25	37.31
	Use after washing	22	32.83
	Discard	20	29.85

After using pesticides, the containers were either sold or discarded by some farmers, but about 22 farmers (32.83%) were reusing the containers after washing. While the pesticide storage practices were not that appropriate, but in this study it was also found that most farmers were aware of the personal protective equipment used during pesticide storing and also the preventive measures taken to avoid direct contact with pesticide. This also reflected in their practices, out of 67 farmers interviewed, 64 farmers (95.5%) were using wooden stick to mix the pesticide with water and 57 farmers (85.08%) were wearing mask, gloves, and shoes while pesticide spraying. Only two farmers (2.9%) were mixing pesticide with water using bare hands and around ten farmers (14.9%) were not using any protective equipment while spraying pesticide on their farms making them prone to the side effects of pesticide exposure.

Table 4 shows that out of 67 farmers, about ten farmers (14.92%) had encountered toxic effects following pesticide spraying. Of which the most common side effects encountered following pesticide use were eye irritation by five farmers (50%), headache and dizziness by 2 farmers (20%), skin burning and itching (10%), nausea and vomiting (10%), and sore throat and cough (10%), of which about six farmers (60%) took home remedies to tackle the above side effects.

DISCUSSION

This study was carried out on the entire population of 80 farmers currently working on the farms of Kodariya village near MHOW, conducted for a period of 5 months from September 2019 to January 2020. The findings in this study have been compared and contrasted with the findings of other such studies done in different parts of India.

In our study, out of 80 farmers interviewed in Kodariya Village, 67 were using pesticides, prevalence came out to be

Table 4: Toxic symptoms due to pesticide and measures taken by the farmers

Symptoms encountered	Frequency (67)	Percentage (100)
Yes	10	14.92
No	57	85.08
Symptoms:	**Frequency (10)**	**Percentage (100)**
Irritation in eyes	5	50
Headache and dizziness	2	20
Skin burning and itching	1	10
Nausea and vomiting	1	10
Sore throat and cough	1	10
How do you tackle these problems	**Frequency (10)**	**Percentage (100)**
Home remedies	6	60
Visit doctor	2	20
No treatment	2	20

83.75%, while in a study done by Dey *et al*. in Barak Valley, Assam, prevalence of pesticide use was 71.02%.[7]

About 47.7% farmers in our study were using pesticides on their farms since 11–20 years and 35.8% farmers were using since 30 years. As per the study conducted by Oztas *et al*., Turkey, 78% farmers had been engaged in using pesticides for more than 40 years.[8] while Farmers had been using pesticides for a mean duration of 21.2 ± 10.5 years in the study conducted by Ntow *et al*. on Ghanaian farmers.[9] Experience in farming is an important factor and is expected to have a positive impact in terms of acquiring skills leading to increased production and improved quality of output.

In our study, we found that "ROKET" was the most commonly used pesticide by 64.18% farmers in Kodariya village used either alone or in combination with other pesticides. The constituent of this pesticide is combination of profenophos (OrganoPhosphate group) and (pyrethroid) cypermethrin which is considered as harmful, while in a study showing the impacts of pesticides on the health of farmers in Fasa, Iran, approximately 86% farmers used pesticides constituting organophosphorus compounds.[10] And according to the study done by Dey *et al*. in Barak Valley, Assam showing impact of pesticide use on the farmers health, farmers used combination of pesticides uch as organophosphates, organochlorides, and carbamates which belong to high or extremely hazardous categories.[7] It shows that pesticides belonging to organophosphate group are most commonly used by the farmers which are hazardous.

In our study, 68.75% of farmers had knowledge about the harmful effects caused by pesticides use while in the previous study done by Satya Sai *et al*. in 2019, Karnataka, it was reported that 75.43% of the farmers were aware of the ill effects following pesticides use.[11] As per the study conducted by Kumar *et al*. in Karnataka to determine farmers awareness regarding pesticide use, 55% of the farmers had knowledge regarding hazards following pesticide exposure.[12] While 84.0% of the farmers were aware that pesticides had a negative effect on human health in the study conducted by Oztas *et al*. Çukurova region, Turkey.[8] Moreover, 85% of the farmers were aware of the detrimental effects following pesticide use on human health in the study conducted by Zyoud *et al*. in Palestine.[13] According to a study conducted by Recena *et al*. in Brazil on pesticide exposure, 92% of the farmers were aware about harmful effects of pesticide use on human health.[14] It shows that farmers of the countries other than India are more aware about the hazards followed by pesticide exposure as compared to the Indian farmers which could be possibly related to the educational status as well as training programs. Hence, there is need to educate the farmers all over the world about the appropriate use of pesticides on their farms and its pros and cons.

In our study, only 10 (14.92%) farmers reported signs and symptoms following pesticide spraying in contrast to the previous study done in Assam by Dey *et al*., where 71% of farmers reported the side effects.[7] In the study conducted by Hurtig *et al*., in the farmers of Amazon Basin of Ecuador, 51.8% of the farmers reported side effects after pesticide use.[15] In the study conducted by Oluwole and Cheke in Nigeria, 91.3% of the farmers reported health symptoms associated with pesticides during or after pesticide application.[16] It shows that the farmers of Kodariya village had lesser incidence of side effects as compared to the farmers of other regions that could be possibly related to practicing safe methods of using pesticides and disposing pesticide containers.

In our study, among ten farmers experiencing side effects, the most common side effects encountered following pesticide spraying were eye irritation by five farmers (50%), headache and dizziness by two farmers (20%), skin burning and itching (10%), nausea and vomiting (10%), and sore throat and cough (10%). Of which about six farmers (60%) took home remedies to tackle the above side effects. While in a study done by Dey *et al*. in Barak Valley, Assam showing impact of pesticide use on the health of farmers revealed that the most common signs and symptoms encountered were chest pain/burning sensation (34.1%), stinging /itching eyes (33.8%), excessive sweating (31.8%), skin redness/white patches (32.8%), excessive salivation (33.1%), numbness/ muscle weakness/muscle cramps (30.5%), and dry/sore throat (20.5%).[7] While in study done by Satya Sai *et al*. Karnataka, most common pesticide related health symptoms were skin problems and neurological system disturbances such as eye irritation (32.75%), headache (25.15%), dizziness (10.53%), breathing difficulty (2.34%), skin rashes (2.34%), and 7.02% claimed to have experienced all of these symptoms at least once during their exposure to pesticides. When such symptoms are seen 69.60% responded that they would consult a doctor, 23.40% ignored and 3.50% used home remedies.[11] In the study conducted by Oztas *et al*. Çukurova region, Turkey, symptoms experienced by the farmers after pesticide application were as follows 3.3% had headache, 3.3% of them had dizziness, 1.4% had vomiting, 1.2% had respiratory distress, 0.7% had nausea, and 0.5% of them experienced abdominal pain, diarrhea, fever, skin pruritus, and eye burning.[8] In the study conducted by Zyoud *et al*., Palestine it was reported that 37.5% of the farmers experienced itchy skin, 37.0% of them had headache, 24.9% of them experienced excessive sweating, and 21.3% of them had diarrhea.[13] In the study conducted by Yassin *et al*., 64.3% of the farmers reported irritation in eyes and face, 32.4% had dizziness, 28.1% of them had chest pain, 26.5% of them had headache, 9.7% had abdominal pain, 8.6% of them had vomiting, 5.4% of them experienced weakness, and 3.2% had fever.[17] It shows that the most common side effects associated with pesticide spraying were the symptoms related to eyes and neurological system. The side effects were related to the organophosphate group of pesticides which is the most common pesticide category used by majority of the farmers of different regions either alone or in combination.

In our study, around 85.08% of the farmers were using personal protective equipment during farming and only 14.92% did not use any Protective Gears while using pesticides, this percentage was 26% in the previous study done by Satya Sai *et al*. in 2019[11] and around 30% of the farmers used no protective equipment while working with pesticides in previous study done in Fasa, Iran in 2012.[10] It shows that the population of farmers in different parts of the world have been upgrading and updating themselves about the knowledge regarding safe pesticide use and its hazards resulting in lesser incidence of side effects as compared to the farmers of other regions due to the use of personal protective equipment.

In our study, 85.08% were using masks, gloves, and shoes together as protective gears. While in the study conducted by Cihan *et al*.in Turkey, 73.2% of the farmers wore gloves, 78.8% of them used masks, and 15.6% of them wore boots.[18] In the study by Yassin *et al*., 19.6% of the farmers wore gloves, 21.7% of them used masks, and 14.8% of them wore boots.[17] In the study by Zyoud *et al*. in Palestine, it was determined that 48.6% of the farmers wore gloves, 63.5% of them used masks, and 63% of them wore protective clothing.[13] Tuna *et al*. in Turkey, found that 37.0% of the farmers always or usually used gloves, 35.4% of the farmers always or usually used masks.[19] In the study conducted by Damalas *et al*., it was found that 72.7% of the farmers never wore gloves, 86.8% of them never used masks, 2.5% of them never wore boots, and 81.0% of them never wore any protective clothing.[20] The findings suggest that the use of personal protective equipment was found to be low in other studies as compared to our study.

CONCLUSION

The use of pesticide is widely prevalent in Kodariya Village of Indore district. Organophosphate group was the most prevalent group of pesticides. Most of the farmers already knew about the harmful effects of pesticides. Farmers were not just theoretically updated but were also practically implementing the knowledge in fields by following safety practices. The harmful effects of pesticides can be minimized using personal protective equipment that actually reflected in their practices and by avoiding going in the fields for sometimes after spray. The most common side effects associated with pesticide spraying were the symptoms related to eyes and neurological system for which most farmers adopted home remedies.

Recommendations

Farmers should receive training and health education regarding safe use and disposal of pesticides. Farmers must also be demonstrated the correct use of personal protective equipment. Clear safety instructions or warning labels must be mentioned on pesticide containers. More number of farmers should shift from conventional farming toward organic farming thereby limiting the use of pesticides and chemical fertilizers to avoid health hazards.

Limitations

- Recall bias
- Time constraints
- Sample population taken does not represent the whole population.

FINANCIAL SUPPORT AND SPONSORSHIP

Nil.

CONFLICT OF INTEREST

There are no conflicts of interest.

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