Afropolitan Journals

ISSN: 2730-7603X www.afropolitanjournals.com

Farmer's Knowledge, Practices and Exposure with Pesticide Usage in Selected Farm Settlements in Kwara State, Nigeria

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Abstract

The study investigated farmer's knowledge, practices and exposure with pesticide usage in selected farm settlements in Kwara state, Nigeria. Three hundred and sixty-three respondents were sampled from two senatorial districts and a local government each, whose residents were predominantly farmers were targeted. Data collected was analyzed using frequency count, percentage and Pearson correlation. It is revealed that, more male 278 (76.6%) respondent farmers participated in the study than their female 85 (23%) counterparts. High level of illiteracy 150 (41.3%) was discovered amongst the farmers who relied upon different sources of information about safe pesticide mixing, storage, and application with Pearson correlation coefficient that signifies a positive linear correlation at $p < 0.01$ and $P < 0.05$ level of significance (2-tailed). Since the results show a very high statistical significance of $p < 0.05$ (2-tails), the hypothesis test that there is no significant relationship between sources of information and pesticides usage by farmers is rejected. This simply means that the respondents did really rely on different sources of information on pesticide usage. The findings also revealed that, the farmers employ unhealthy and poor practices due to high level of illiteracy by not following the recommendations regarding the safe usage of pesticides which makes them susceptible to pesticides exposure. It is therefore concluded that, there is significant relationship between farmer's practices in the usage of pesticides and their level of exposure to pesticides. It is recommended that farmers should be enlightened more about the toxic effects of pesticides exposure as well as self protective literacy on pesticide application in other to protect themselves from pesticide exposure associated degenerative diseases.

Keywords: Pesticide, Exposure, Knowledge, Practice, Settlement.

Introduction

According to the EPA (2018), a pesticide is any agent or combination of compounds used to control, eradicate, or repel pests. These pests include microorganisms as well as insects, animals, and weeds. In other words, a pesticide can be defined as any compound or combination of substances used as a plant regulator, defoliant, or desiccant. Consequently, agricultural pesticides are those substances that farmers use to lessen the impact of pests on the development and yield of agricultural crops. The Food and Agriculture Organisation (2017) further defined a pesticide as any substance or combination of substances intended for preventing, destroying, or controlling any pest, including vectors of human or animal disease, undesirable species of plants or animals, causing harm during or otherwise

interfering with the production, processing, storage, transport, or marketing of food, agricultural commodities, wood and wood products, or animal feedstuffs, or substances that may cause reproductive harm.

In addition to being used in agriculture to destroy pests that harm crops, pesticides are also utilised in public health to kill disease vectors like mosquitoes. According to the World Health Organisation (WHO, 2018), pesticides are chemical substances used to get rid of pests like insects, rodents, fungi, and undesired plants (weeds). Pesticides must be used carefully and disposed of correctly because, by their very nature, they may be toxic to humans and other living things. A high level of contamination and poisoning of pesticide users, agricultural workers, and bystanders has been shown to occur on an unnecessary and intolerable basis worldwide. These pesticide residue-related public health and food safety issues have become more urgent in recent years. The increased consumer demand for safe food, not just in rich nations but also increasingly in poor countries, may be partially responsible for the increase in reporting of these issues (Hailay et al., 2016).

Food residues, pesticide exposures inside and outdoors, occupational exposures, and improper pesticide usage on domestic animals and agriculture are the main ways that humans are exposed to pesticides. Additionally, there are worries about pesticides or their byproducts contaminating sources of drinking water (Pesticides and our Health, 2015). An enormous number of people worldwide pass away every year as a result of pesticide exposure. The farming community has stated that acute pesticide poisoning is a major short-term problem (Hailay *et al.,* 2016)

Particularly on vulnerable groups, there are observed long-term health impacts, including carcinogenic and endocrine disrupting qualities. Insufficient knowledge, non-use or inappropriate use of personal protective equipment (PPE), improper pesticide storage at home, a negative attitude towards pesticides, and inappropriate practises were among the factors identified in previous studies as contributing to the morbidity and mortality of pesticide exposure (Tessema *et al.,* 2021). According to a study by Hailay *et al.* (2016) on the usage of pesticides on agricultural farms in Ethiopia, the sprayers accepted the advice to wash off any pesticide splashes on their bodies but did not appear persuaded of the value of visiting a clinic for additional treatment. A small number said that using pesticides shouldn't be a problem at all, whereas the clear majority thought that careful handling was more necessary than wearing protective equipment.

Minnikanti *et al.* (2019) opined that, majority of the participants were aware of the pesticides they use and the negative consequences associated with it. Participants felt that information from co-farmers and retailers was more trustworthy than information from media advertisements. This can be the case because it is challenging to relate the knowledge presented in advertisements to practical situations. In many developing nations, it is more typical practise to store pesticides in unsecured locations (Sarkar *et al.,* 2021). According to the findings of a different study, 36.25% of farmers kept pesticides inside the home, while 12.28% kept them outside (Lekei *et al.,* 2014). This indicates that

there is a considerable risk of exposure for farmers and family members due to storage in easily accessible locations.

In order to effectively prevent or reduce the health and environmental risks connected with pesticides, it is crucial to assess farmers' knowledge of pesticides and safety procedures. According to Muhammad *et al.* (2019), improper application of pesticides can have a negative impact on human health. To prevent these consequences, safety precautions must be taken. Due to the high rate of illiteracy in the area, farmers frequently consult their fellow farmers for guidance since they are unaware of the biosafety concerns. The knowledge level of farmers on the safe use of pesticides is greatly influenced by factors including education level, land ownership, total area of land, and trainings on safe pesticide usage.

If applied improperly, all pesticides have the potential to cause harm to people, animals, other living things, and the environment. According to a study from Tanzania (Mrema, *et al.*, 2017), 68% of farmers there reported experiencing various health symptoms after being exposed to pesticides, including feeling ill, skin issues, and neurological symptoms. A number of tactics have been suggested as essential for protecting farmers against pesticide exposure. These include interpreting labels, using safe practises such as wearing PPE effectively, and having the appropriate knowledge and attitudes on pesticide protection.

Statement of the Problem

In order to produce and preserve an abundance of high-quality food, modern farming uses a variety of chemicals, including pesticides, fertilisers, and crop preservatives (Adekunle *et al.*, 2017). The production and productivity of agriculture have increased as a result of the use of chemical inputs like pesticides. As a result, productivity and quality of the produce can be improved, even in terms of cosmetic appeal, which is frequently essential to consumers. Pesticides are widely employed in most areas of agricultural production to avoid or reduce losses caused by pests (Adekunle *et al.*, 2017). In Nigeria, pesticides have shown to be essential instruments in preventing pest-related pre-harvest and post-harvest losses. By preventing pest-related damage, they also ensure sustainable food production, resulting in increased yield and year-round availability of food. The productivity-enhancing effects of pesticides have been highly valued, despite the fact that most studies hardly ever consider their effects on the environment and on farmers' health (Adekunle *et al.*, 2017). This is due to the fact that increasing agricultural intensification and food security in Nigeria have led to increased health and environmental concerns. Pesticides are used in the environment, according to Dey *et al*. (2013), to reduce the impact of plant and animal pests and to safeguard agricultural and industrial products. Pesticides can occasionally increase the food's safety as well as its nutritional value (Rizzo *et al.*, 2021). There are a variety of additional advantages that pesticides may provide, but the general public frequently ignores these advantages. In light of this, pesticides can be seen as an effective, cost-effective, and labor-saving technique for pest management that is widely used in most areas of agricultural production (Sarkar *et al.*, 2021). To decrease losses due to pests and illnesses, crop growers use a variety of insecticides at various concentrations. The health

risks associated with exposure when mixing and applying pesticides, working in treated fields, and residues on food and in drinking water for the general population have been raised, despite the fact that pesticides are popular and widely used by farm households (Sarkar *et al.,* 2021). These practises have resulted in a number of accidental occupational poisoning cases, mortality, morbidity, and even the routine use of pesticides can pose substantial short- and long-term health concerns to farmers as well as environmental degradation.

However, farmers in developing nations face significant exposure risks because of the use of hazardous substances that are prohibited or restricted in other nations, improper application methods, outdated or completely inappropriate spraying equipment, poor storage procedures, and frequently the reuse of old pesticide containers for the storage of food and water (Russuu, 2023).

Four key entry points—the mouth, nose, intact skin, and eyes—are known for allowing pesticides to enter human circulatory systems. Exposure to pesticides is known to have a number of negative health effects, including both short-term acute effects like abdominal pain, headaches, nausea, and vomiting, as well as long-term conditions like cancer, reproductive and developmental disorders. It is also typical to experience effects on the central nervous system (CNS), such as agitation, memory loss, convulsions, and coma. Additionally, effects on the parasympathetic and sympathetic nervous systems, including deadly respiratory paralysis, have been commonly reported (US EPA, 2017).

The influence of pesticides on public health, and in particular the health of farm workers, has increased as a result of improperly regulated and unsafe use of pesticides and a lack of suitable education (Deyet *et al.,* 2013, Adekunle *et al.,* 2017). Education is the most effective strategy to stop the spread of agricultural pesticides and excessive exposure to them. If more farmers, particularly those in developing nations, were aware of the dangers associated with these pesticides, they would use them more cautiously and use protective gear when spraying. This is due to the terrible health effects that pesticide exposure has on farmers, especially on female farmers' ability to reproduce. The developing world needs special consideration since, in addition to having lower health, they are typically more dependent on agriculture as their primary economic and source of income. It is essential to look into farmers' knowledge, practises, and exposure to pesticide usage in specific farm settlements in Kwara State, Nigeria, given the negative health effects of pesticide exposure among farmers, who make up a larger portion of the workforce in West Africa's economy and, most importantly, Nigeria.

Objectives of the Study

- To assess farmer's knowledge on the use of pesticides.
- To investigate common practices by farmers in the use of pesticides.

Research Questions

- What are the sources of information on pesticides usage available to farmers?

- Do the common practices by farmers in the use of pesticides affect their level of exposure?

Research Hypotheses

- There is no significant relationship between sources of information and pesticides usage by farmers.
- There is no significant relationship between common practices by farmers in the use of pesticides and level of exposure.

Significance of the Study

This study is important in investigating farmer's knowledge, practices and potential toxicity associated with pesticide use in selected farm settlements in Kwara State, Nigeria. The findings of this research work will play an important role to the policy makers such as Ministry of Environment, Ministry of Health, Environmental Health Officers Registration Council of Nigeria, State and National House of assembly, Federal and State Government in formulating, reviewing and implementing the existing laws guiding the production, transportation, usage and storing of pesticides. The study will go a long way in identifying pesticides that are toxic to human health, thereby discouraging their use. More so, the findings from this result will enlighten farmers who account for about 70% of total workforce in West Africa on the dangers exposure to pesticides pose on their health. Knowledge, attitude, taken precautions and how important usage of personal protective equipment during all stages of pesticides handling will be strengthened. The findings of this research work will also enable policy makers and the general public to be aware of the current trend in diseases occurrence that are related to pesticides exposure. The finding will also awaken the Ministry of Environment including the environmental health officers in dedicating, committing and hardworking in sensitizing producers, farmers and the general public at large on the dangers of pesticides exposure if incorrectly use. Finally, the findings of this research work will educate the researcher in knowing more in the area of environmental health particularly when it comes to safe pesticides usage and danger associated with exposure if incorrectly use.

Materials and Methods

Study Area

The study area includes farm settlements across Kwara state, Nigeria where the populace are predominantly farmers. Kwara is a state in Nigeria, located within the North-Central geopolitical zone, commonly referred to as the Middle Belt. Its capital is Ilorin. Agriculture is the main source of the economy, yams, cassava, corn (maize), sorghum, millet, onions, and beans are the most important staple crops; rice and sugarcane are significant cash crops in the Niger floodplains. Cotton and tobacco are grown, and cotton weaving, pottery making, and the making of raffia mats are the traditional crafts (KWSG, 2019).

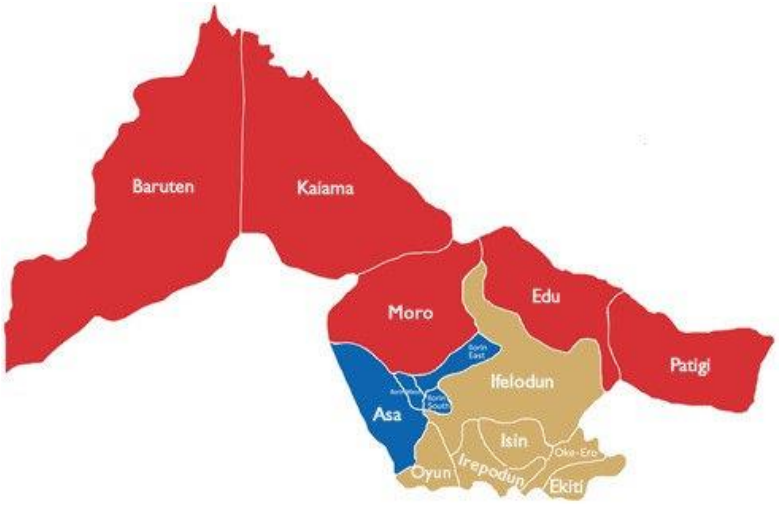

Figure 1: Map of Kwara State (KWSG, 2019)

Research Design

A cross sectional descriptive study was used for this research since the study cut across farm settlements in the study area.

Population

A population is the entire group of items/elements which the researcher wishes to study and generalized about. It is the sum total of sampling unit (babajide, 2011). According to National Population Commission (2006), Kwara State has a population of Two million, three hundred and sixty-five thousand, three hundred and fifty-three (2,365,353). The population for this study comprises all the residents in the study area, Kwara state.

Target Population

Out of all the residents in the study area, those that are in the farm settlements who work and spray pesticides on their farm land were targeted.

Sample Size

The sample size from the target population for this study was determined using a formula proposed by Yamane in 1967. A 95% confidence level and P = 0.05 was assumed. The selected sample size is arrived at by the following formula:

$$n = \frac{N}{1 + N(e)^2}$$

Where:

N: is the population size

e: The desired level of Precision/ level of accuracy

e = 0.05 is assumed.

$$n = \frac{2,365,353}{1+ 2,365,353(0.05)^2}$$

$$n = \frac{2,365,353}{5914.3825}$$

= 399.9 Approximately = 400

Attrition factor was considered by adding ten percent (10%) of the calculated sample size which is 400 + 40 =440

Sampling Technique

The entire population of residents in Kwara State, which constitute the population of this study cannot be fully covered, thus, the need for sampling. For this study, stratified, proportionate and purposive sampling methods were adopted. Kwara state was stratified into senatorial districts, which are Kwara Central, North and South. Since, there are more farmers and farm settlements in Kwara North and South, one Local government each (Edu and Ekiti) from Kwara North and South who are predominantly farmers constitute the sample for the study.

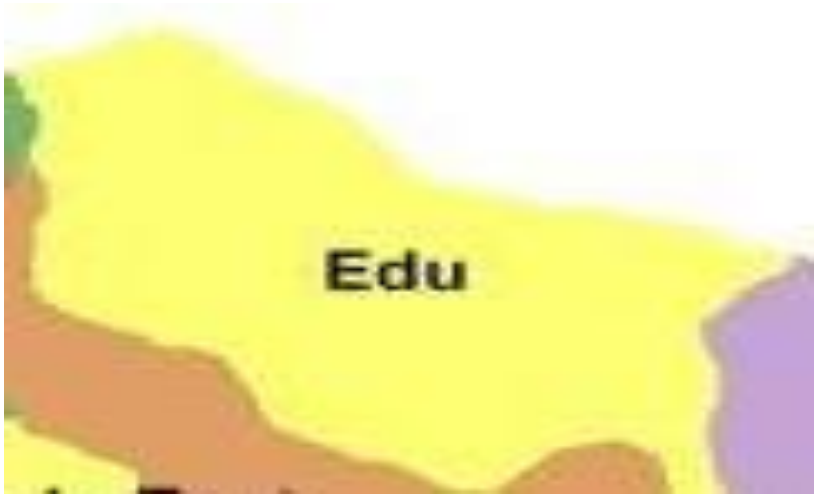

Figure 2: Map of Edu Local Government Area in Kwara State KWSG (2019)

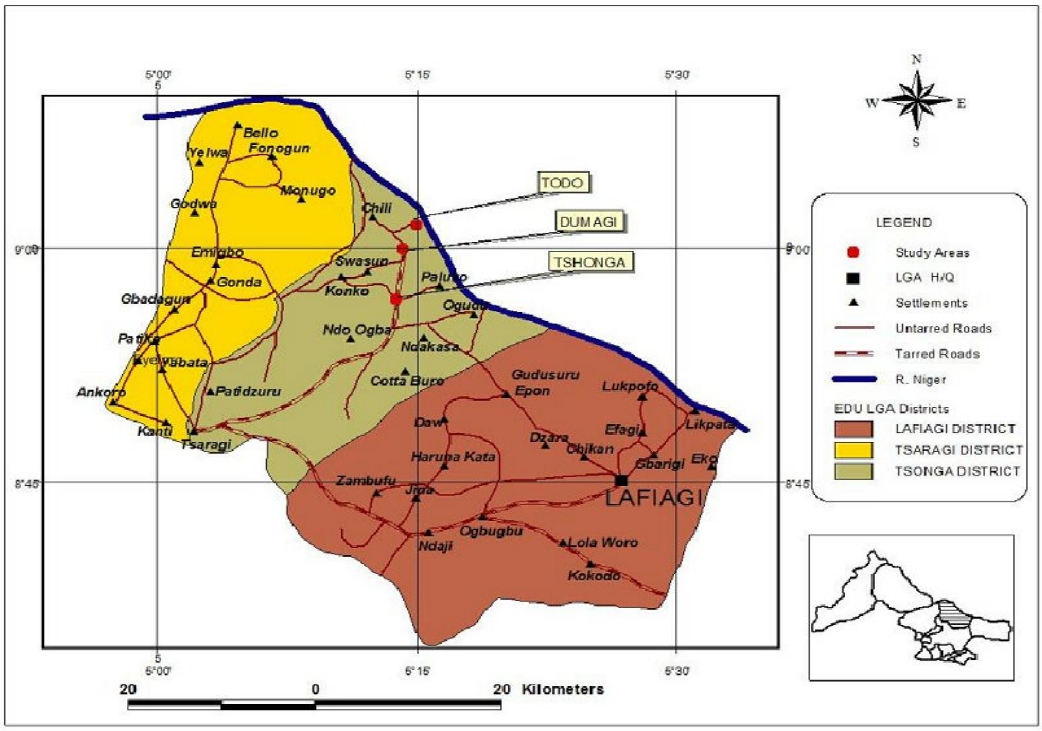

Figure 3: Map of Ekiti Local Government Area in Kwara State (KWSG, 2019)

Data collection

Data was collected through face to face interviews, using a questionnaire. The questionnaire was designed in English language and translated into the local language that is understood by majority of the farmers with the help of research assistant(s). The questionnaire has closed ended questions which were formulated and arranged in a choice format that made the respondents select only the appropriate answers that they thought best described their opinion or attitude on a particular issue.

Validity of Instrument

To validate the instrument, the contents of the questionnaire was examined for language difficulty as well as to determine whether or not the items of the questionnaire would elicit desired responses that are relevant to the study. The questionnaire was tested and administered on farmers outside the sampled areas of the two local governments. The result collected after analysis affirmed its validity.

Data Analysis

Collected data was analysed using Frequency Count and Percentage, Chi-Square and Pearson Correlation statistical tools through the use of Special Package for Social Science (SPSS) software.

Result and Discussion

Table 1: Sex Distribution

Sex	Number	Percentage
Male	278	76.6
Female	85	23.4
Total	363	100.0

Field Survey, 2022

Table 1 shows that, out of the 363 total respondents farmers sampled for this research study, 278 (76.6%) respondents were male and the remaining 85 (23.4%) were female.

Table 2: Educational Level Distribution of Respondents

Educational Level	Sex Distribution				Total	
	Male	%	Female	%	Total	%
Illiterate	96	25.4	54	14.9	150	41.3
Primary	72	19.8	5	1.4	77	21.2
Secondary	76	20.9	6	1.7	82	22.6
Graduate	34	9.4	20	5.5	54	14.9
Total	278	76.6	85	23.4	363	100.0

Field Survey, 2022

Table 2 shows that, of the 150 (41.3%) respondents who are illiterate, 96 (25.4%) were male and the remaining 54 (14.9%) were female respondents; of the 77 (21.2%) respondents who have completed primary school, 72 (19.8%) were male and the remaining 5 (1.4%) were female respondents; and of the 82 (22.6%) respondents who have completed secondary school, 76 (20.9%) were male and the remaining 5 (1.4%) were female respondents. Last but not least, there were 54 respondents (14.9% of the total) with a graduate degree; of these, 34 (9.4%) were men and 20 (5.5%) were women, for a total population of 363 respondents.

Hypothesis Testing

Table 3: Ho_1: There is no significant relationship between sources of information and pesticides usage by farmers.

		a	b	c	d	e	f	g
a - Information on safe pesticide usage was gotten from extension workers from the department of Agriculture either from state or local governments	Pearson Correlation	1	-.151**	.003	.669**	.741**	.807**	.777**
	Sig. (2-tailed)		.004	.951	.000	.000	.000	.000
	N	363	363	363	363	363	363	363
b - Rely on information regarding safe pesticide usage by fellow farmers	Pearson Correlation	-.151**	1	.699**	-.010	-.216**	-.075	-.113*
	Sig. (2-tailed)	.004		.000	.844	.000	.155	.032
	N	363	363	363	363	363	363	363
c - Depend on information regarding pesticide usage given by retailers when buying products from them	Pearson Correlation	.003	.699**	1	.155**	-.058	.082	.042
	Sig. (2-tailed)	.951	.000		.003	.268	.118	.426
	N	363	363	363	363	363	363	363
d - Receive and follow instructions on safe pesticide usage made available by the agents/representatives	Pearson Correlation	.669**	-.010	.155**	1	.566**	.828**	.714**
	Sig. (2-tailed)	.000	.844	.003		.000	.000	.000
	N	363	363	363	363	363	363	363
e - Receive information on safe pesticide usage from radio and television	Pearson Correlation	.741**	-.216**	-.058	.566**	1	.683**	.761**
	Sig. (2-tailed)	.000	.000	.268	.000		.000	.000
	N	363	363	363	363	363	363	363
f - Follow safe pesticide usage information receive from literature	Pearson Correlation	.807**	-.075	.082	.828**	.683**	1	.757**
	Sig. (2-tailed)	.000	.155	.118	.000	.000		.000
	N	363	363	363	363	363	363	363
g - Obtain information (latest) regarding safe pesticide usage from internet	Pearson Correlation	.777**	-.113*	.042	.714**	.761**	.757**	1
	Sig. (2-tailed)	.000	.032	.426	.000	.000	.000	
	N	363	363	363	363	363	363	363

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

A positive linear association is shown by a Pearson correlation coefficient in table 3 above at the p 0.01 and p 0.05 level of significance (2-tailed). The significance test that found no connection between information sources and farmers' use of pesticides is disproved.

Considering that the results have a very high statistical significance of p 0.05 (2-tails). This only indicates that prior to employing the pesticide, the respondents did in fact depend on the information provided about its use.

Table 4: HO_2: There is no significant relationship between common practices by farmers in the use of pesticides and level of exposure. (Field Survey, 2022)

Respondents' practices regarding safe pesticide usage	Always	%	Sometimes	%	Never	%	Total
a - Read the instructions written on the container	60	16.5	49	13.5	254	70	363
b - Mix in the right proportion according to instruction	81	22.3	272	74.9	10	2.8	363
c - Mix with naked hands	77	21.2	169	46.6	117	32.2	363
d - Use stick or acceptable means for mixing	49	13.5	213	58.7	101	27.8	363
e - Wear gloves before using hand for mixing	49	13.5	237	65.3	77	21.2	363
f - Wear long dress only before starting a spray	154	42.4	152	41.9	57	15.7	363
g - Wear long dress and boot before starting a spray	84	23.1	91	25.1	188	51.8	363
h - Wear gloves and mask to protect hand and face	43	11.8	161	44.4	159	43.8	363
i - Smoke during pesticide applications	31	8.5	119	32.8	213	58.7	363
j - Eat and drink during applications	31	8.5	187	51.5	145	40.0	363
k - Eat and drink after washing hand with soap and clean water	71	19.6	241	66.4	51	14	363
l - Use small wire to remove blockage	63	17.4	265	73	35	9.6	363
m -If the nozzle gets blocked, I blow it with my mouth to clog out	54	14.9	254	70	55	15.2	363
n - Wash contaminated clothes in a separate load	98	27	218	60.1	47	12.9	363
o - Take bath after completing the application	142	39.1	202	55.6	19	5.2	363
p - Dispose-off empty container according to the prescription	34	9.4	109	30	220	60.6	363
q - Use empty container as an utensil for other purposes in the house	33	9.1	246	67.8	84	23.1	363
r - Pesticides purchased only sufficient for one season	95	26.2	235	64.7	33	9.1	363
s - Pesticides can be stored in the animal shelter but in a separate room	65	17.9	229	63.1	69	19	363
t - Pesticides stored at home in a separate room	49	13.5	270	74.4	44	12.1	363
Total	1363	19	3919	54%	1978	27%	

The information gained from merchants where the farmers purchased the products shows a linear association with that gathered from fellow farmers, according to the findings from respondents in table 1.3. This is due to Pearson Correlation (r) = 0.699** at a significance threshold of p 0.05. Furthermore, there is a correlation between information obtained from agricultural extension agents working for state or local governments' departments of agriculture and information obtained from other farmers, with Pearson Correlation (r) = -0.151** at a significance level of p 0.05. However, where Pearson Correlation (r) = 0.003 at p > 0.05 level of significance, there is no significant association between information obtained from agricultural extension workers from the department of agriculture, either state or local governments, and information obtained from other farmers. Additionally, there was no association between the data collected from other farmers and that collected from agents or representatives. This is due to Pearson Correlation (r) = -0.010 at a level of significance greater than 0.05. The table also shows that there is a correlation between information obtained from other farmers and information obtained from radio and television, with Pearson Correlation (r) = -0.216** at a significance level of p 0.05. Information on safe pesticide usage is also available online with Pearson Correlation (r) = -0.777** at p 0.05 level of significance, as well as from agricultural extension personnel from the department of agriculture in either state or municipal governments. Retailers are given information about safe pesticide usage via agents and representatives. With Pearson Correlation (r) = 0.155** at a significance level of p 0.05, it can be concluded that information obtained from agents or representatives and that from merchants are correlated. At the p 0.01 and p 0.05 level of significance, there is typically a positive linear association between the sources of information available to farmers and safe pesticide usage. According to Muhammad *et al.* (2019) and Minnikanti *et al.* (2019), sources of information available to farmers have a substantial impact on their ability to use safe pesticides. This finding is consistent with their findings. The results of this study are consistent with those of Adegbola *et al.* (2011), who found that Nigerians' lack of information, understanding, and awareness of the risks linked with pesticide use is concerning.

Table 4 shows some typical agricultural pesticide usage practises. It demonstrates that a substantial majority of farmers—254 (or 70%) of the 363 total respondents—do not read the directions on pesticide containers before using them. The majority of farmers were found to be illiterate, and 77 (21.2%) of them admitted to mixing pesticides with their bare hands either always or occasionally before applying them. The research by Benjamin et al., (2019), which indicated that the majority of study participants (92.7%; 191 farmers) were observed using their bare hands to mix the powder insecticides with water before spraying, supports the findings of this research. Before applying pesticides, 188 (51.8%) of the farmers surveyed stated they never wore long dresses and boots, and 159 (43.8%) answered the same about protective gloves and face masks. This outcome contrasts with a Minnikanti *et al.*, 2019 study, which found that 74% of growers were aware that wearing protective gear was necessary when using pesticides. 145 (40%) claimed they eat and drink during pesticide

application while 241 (66.4%) sometimes wash their hands with soap and clean water before eating and drinking. If the nozzle gets blocked, 254 (70%) of the farmers sometimes use their mouth to blow it so as to clog out, 55 (15.2%) never used their mouth and 54 (14.9%) used mouth for this act. Out of the 363 farmers, 98 (27%) washed their clothes in a separate load, while 142 (39.1%) said they bathed after pesticides application. Majority of the farmers 220 (60.6%) don't dispose pesticides' containers according to instruction, 246 (67.8%) used empty pesticides' containers as utensils and other purposes at homes while 270 (74.4%) of the farmers stored pesticides at homes. This result is in accordance with Mohanty *et al.,* (2013) and Lekei *et al.,* (2014) who opined that, unsafe disposal of both unwanted pesticides and empty pesticide containers could put general population at higher risk. The findings generally reveal that the farmers employ unhealthy and poor practices by not following the recommendations regarding the safe usage of pesticides. The study also reveals that majority of the farmers dispose pesticides' containers indiscriminately on farmland while more than half of the farmers use unsafe storage practices pesticides.

Conclusion

The study investigated farmer's knowledge, practices and potential toxicity associated with pesticide use in selected farm settlements in Kwara state, Nigeria. Three hundred and sixty-three respondents were sampled from two senatorial districts and a local government each, whose residents were predominantly farmers. It is revealed that, more male 278 (76.6%) respondent farmers participated in the study than their female 85 (23%) were counterparts. High level of illiteracy 150 (41.3%) was discovered amongst the farmers, even the farmers that claimed to have primary school certificate were observed could not read fluently the instructions written on pesticides' containers not to talk of interpretation.

Respondent farmers relied upon different primary sources of information about safe pesticide mixing, storage, and application. The majority of farmers relied upon information on safe pesticides usage from fellow farmers, retailers, radio and television. Hence, there is significant relationship between information available to farmers and safe pesticides usage. The findings also reveal that the farmers employ unhealthy and poor practices by not following the recommendations regarding the safe usage of pesticides which includes inadequate knowledge, mixing pesticides with naked hands, eating, drinking and smoking during pesticides application, non-use or inappropriate use of PPE, blowing nozzle of sprayers/knapsack with mouth when blocked, disposing empty pesticides' containers indiscriminately, using empty pesticides' containers as utensils and other purposes, improper storage of pesticides at home, and negative attitude towards pesticide. These inappropriate practices make farmers to be susceptible to pesticides exposure and high level of illiteracy discovered amongst the farmers is the main factor for these unhealthy and poor practices. It is therefore concluded that, there is significant relationship between farmer's practices in the usage of pesticides and their level of exposure to pesticides.

Recommendations

- It is recommended that farmers should be enlightened more about the toxic effects of pesticides exposure as well as self protective literacy on pesticide application in other to protect themselves from pesticide exposure associated degenerative diseases.
- Behavioural change programs on safety precautions while spraying pesticides should be frequently organised which would be beneficial for the promotion of farmer's health, eradicate or minimise the toxic residues of pesticides in the environment and food. This can be done by educating farmers and exposing them to training on the safe usage of pesticides
- More researches on higher-order controls to reduce pesticide exposure, understand the reasons for the proper utilization of personal protection equipment (PPE), and identify effective training methods should be encouraged.
- Adequate and widen environmental studies should focus on providing education on pesticide safety and protection standards for workers in order to mitigate health risks; owing to their insufficient knowledge of the harmful effects of pesticide exposure because farmers and farm workers in Nigeria rarely adopt precautionary measures while applying pesticides.
- Banned pesticides are freely available in the open markets for the farmers to purchase in Nigeria. This confirms that the pesticides regulation policy in the state and indeed in Nigeria as whole is poorly implemented. Legislation against toxic and harmful pesticides should be made and strictly enforced.
- In addition, promotion of alternative pest control strategies such as application of bio-pesticides should be introduced, available and encouraged by Governments, Tertiary Institutions and Research Institutes. This would reduce the dependency of chemical pesticides as well as their adverse impact on human health and environment.

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