ASSESSMENT OF KNOWLEDGE ABOUT HEALTH RISKS ASSOCIATED WITH PESTICIDE USE AMONG FARMERS IN ZARIA LGA, NIGERIA.

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Abstract

Globally, pesticides are essential substances that have significant importance in increasing food production and pest management. Although, they are known human and environmental toxicants. The aim of this study was to determine the knowledge on health risk associated with the use of pesticide among farmers in Zaria LGA. A cross-sectional study using structured questionnaire was used to generate responses from 205 farmers across eight statistically identified communities from the selected two wards in each of the two zones of Zaria. The result showed that knowledge in relation to health risk among human, animals and environment while using pesticide was found to be 73%, where only 16% don't know the route of exposure. Those reported to have experienced symptoms of health problems associated with exposure, such as Sneezing, cough or sore throat were 23%, skin irritation 22%, nausea 22% and blurred vision 20%. However only about 5% diagnosed in the health facility and 0.5% developed carcinogenic chronic effect. As such a statistically significant relationship was reported between knowledge of farmers with level of education with the P value < 0.05. In conclusion farmers were found to know the health risk of pesticide & routes of exposure to human, animals and environment. Though use of protective measures, storage and disposal measures was found to be poor, with boot, hat/cap and mask as minimum PPE used among the studied population and the symptoms of health related problems were not adequately reported to health care provider.

Keywords: *Pesticides, Farmers, Knowledge, PPE*

I. INTRODUCTIONS

Pesticides are substances or mixture of substances intended for preventing, destroying, repelling or mitigating any pest, including vectors of human or animal disease, unwanted 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 feed or substances which may be administered to animals for the control of insects, arachnids or other pests in or on their bodies. (Gilden *et al*.,2010).

Consequently in low- and middle-income countries (LMICs) like Nigeria, lack of monitoring, awareness and reporting systems for both the health and environmental impacts of pesticides, most incidences related to pesticides exposure go undetected, which are also contributing factors for increased morbidity and mortality among farmers exposed to highly hazardous pesticides. (Sosan *et al*., 2008)

In Nigeria mostly-deadly chemicals are used due to their being cheaper than newer safer pesticides. (Andrade-Rivas. & Rother, 2016) As such the potential to release chemicals into the environment to cause harm is largely high which has a direct correlation between behavior during pesticide handling, eg spraying,

transporting, storing and reuse of empty containers. (Andrade-Rivas. & Rother, 2016). However, the increasing morbidity and mortality due to pesticide exposure and poisoning is a great concern especially with the inadequate notification to health authorities. (Kapka-Skrzypczak *et al*., 2011)

Knowledge of safe pesticide handling is often inadequate as many African and other developing countries suffer from weak import controls, lack of training on appropriate pesticide use, inappropriate donations and aggressive sales practices, poor storage and stock management, pressure to stockpile for unforeseen emergencies, and a lack of safe destruction technologies. (Kapka-Skrzypczak *et al.*, 2011 and Baudoux, 2004)

Though a good number of farmers are disposed to the use of pesticides, many are unaware of pesticide types, level of poisoning, safety precautions and potential hazards on health and environment. (Adogame, 2007)

The low level of knowledge, information and awareness among Nigerians, on the dangers associated with the use of pesticides is not good, because a survey conducted in 2011 at the Dawanau International grain market, Kano State, responsible for a large percentage of cowpea consumed in Nigeria, where over 80% of the traders interviewed reported that government's ban on the use of gammalin (lindane) to preserve beans against weevils is unjustified. Based on perceived effectiveness, lower costs, and non-persuasion about associated adverse effects, many of the merchants indicated they would continue to use the "time-tested" product. (Adegbola *et al*., 2016) These adverse effects of pesticides contamination which arise during the application of pesticides, are mainly due to lack of information, knowledge and awareness, poor legislation or of enforcement of legislation, and sales in the open market of high pesticides. (Adegbola *et al*., 2016).

In Nigeria, a study done to assess the Health and Environmental impacts of pesticide use showed that 91.3 % respondents know that they or someone in their family had suffered from pesticide-related health symptoms during or after application of pesticides (Oluwafemi *et al*., 2009 & Ogah *et al*., 2024). As such they reported multiple health effects such as nausea, headache, vomiting, eye irritation and skin problems, with farmers reporting a minimum of two and a maximum of five symptoms of illness. The symptoms experienced by the farmers during preparation, application/spraying of the pesticides is 94.7%, yet 88.9% know that they did not take any protective measures when handling pesticides (Oluwafemi *et al*., 2009 & Ogah *et al*., 2024)

Therefore the severity of any health effect from pesticide poisoning depend on the dose, the route of exposure, how easily the pesticide is absorbed, the type of effect of the pesticides and its metabolites (WHO, 1990), the accumulation and persistence in the body and lastly, the health status of the individual. (FAO, 2016) As such the effect may be acute, showing immediately after the exposure, or chronic, showing only after prolonged us.

Zaria Local Government Area (LGA), Kaduna State, Nigeria which is located at latitude 11.085541 and longitude 7.719945 or 11°04′N 7°42′E**,** and it also covers an area of 563 km² (217 sq mi). The area is known for its moderate climate, however, it is a center of agriculture, and cultivating a few local crops important for the national economy such as cotton, corn, tobacco, and millet.

II. MATERIALS AND METHOD

The study was a descriptive cross-sectional study across thirteen wards that were stratified into North and South. Two wards each were selected from the strata, by using balloting and multistage sampling technique, were used to select the communities, household/farm and the respondents. Semi-structured questioner was used to collect data between July and August 2023.

Inclusion criteria:

Farmers who were more than 18 years age & both genders, who use pesticides on their farmland for at least two cycle of farming season.

Exclusion criteria:
Farmers who do organic farming, those who travel during the period of the study and those who were visitors to the household of the farmers.
Sample size determination:
The sample size for the study was determined using Fisher's formula, (Araoye, 2004) for estimating single proportions and estimation for minimum sample size, and an estimated sample size of 205 using the prevalence of farmers who used personal protective equipment (PPE) while applying pesticides in a previous study = 15%. (Okafoagul *et al.*, 2017)

$$n = \frac{Z^2 pq}{d^2}$$

Where:
n = sample size;
Z = Standard deviation for 95% confidence level = 1.96
P = prevalence of the attribute (15%), = 0.15
d = acceptable difference or precision of the study; if 5%, d = 0.05
q = complementary probability $1 - p$ = 1- 0.15

$$n = \frac{1.96^2 \times 0.1275}{0.05^2}$$
$$= \frac{3.84 \times 0.1275}{0.0025}$$
$$= \frac{0.4896}{0.0025}$$
$$= 195.84$$

To accommodate for non-response, 10% of the calculated sample size was added. This amounted to 205 respondents.
Statistical analysis:
The statistical package for social sciences (SPSS) software version 25.0 was used to determine the mean responses. The socio demographic of the farmers were presented in frequencies and percentages and mean scores obtained. Knowledge, attitude and practice scores were graded. Chi square test was used to determine the relationship between socio-demographics and knowledge, of the farmers.

III. RESULT

Table 1: knowledge of pesticide on health risk to human, animal and environment

Response	**Frequency N = 209**	**Percentage (%)**
True	153	73
False	17	8
Don't Know	39	19
Total	209	100

As shown on table 1, more than half on the farmers (73%) know the health risk of pesticide to human, animals

and environment by answering true, but few 19% among them don't know, while about 8% answered false.

Table 2: Knowledge on routes of pesticide exposure

	Total response =209		
Routes of exposure	**True Frequency (%)**	**False Frequency (%)**	**Don't Know Frequency (%)**
Workplaces (office, provision shops etc.)	8 (4)	168 (80)	33 (16)
Farmland	172 (82)	13 (6)	24 (12)
Foods we eat	161 (77)	25 (12)	23 (11)
Water we drink	161 (77)	22 (11)	26 (12)
Through the skin	203 (97)	1 (0.5)	5 (2.5)
Through the Eyes	203 (97)	0 (0)	6 (3)
Through the nose	205 (98)	0 (0)	4 (2)
I know the health facility to report following exposure	14 (7)	195 (93)	0 (0)

Table 2, shows about 80% of the farmers know pesticide exposure occur on the farmland not on the workplace (office, provision shops etc.), while about 16% don't know. Also majority of them know the route of exposures (food, water, skin, eye and nose), with a very good knowledge of more than 90% through the Skin, Eyes and Nose, However more than 90% don't know the health facility to report to when exposed to seek for medical advice rather engage in self-medication. However about 7% know where to seek medical advice.

Table 3: Symptoms of health problems associated with exposure

	Total Response = 209	
Symptoms of health problem	**Yes (%)**	**No (%)**
Experienced any symptoms of health related problem	48 (23)	161 (77)
Sneezing, cough or sore throat	48 (23)	161 (77)
Tiredness or fatigue	36 (17)	173 (83)
Skin Irritation	47 (22)	162 (78)
Dizziness	35 (17)	174 (83)
Blurred vision	42 (20)	167 (80)
Nausea	46 (22)	163 (78)
Vomiting	17 (8)	192 (92)
Has these symptoms been diagnosed in any of the health centers	10 (5)	199 (95)
lead to any of the chronic effects such as immunological	0	209 (100)
Neurological	0	209 (100)
Carcinogenic	1 (0.5)	208 (99.5)
Reproductive & developmental	0	209 (100)

As reported on table 3, all the farmer know the symptoms associated to pesticide exposure, where majority experienced Sneezing, cough or sore throat (23%), skin irritation (22%), nausea (22%) and blurred vision (20%). However only about 5% diagnosed in the health facility and 0.5% was lead to carcinogenic chronic effect.

Table 1: Association between some socio-demographic factors and knowledge

Variable	Good Knowledge N= 153	Poor Knowledge N= 56	X^2	P value
Age Group (years)				
18-30	49 (64)	28 (36)		
31-40	63 (77)	19 (23)	6.642	0.05
41-50	38 (81)	9 (19)		
51-60	3 (100)	0 (0)		
Highest Level of Education				
Non	59 (65)	32 (35)		
Certificate	72 (77)	22 (23)	8.595	0.04*
Diploma	13 (87)	2 (13)		
Degree	9 (100)	0 (0)		
Marital status				
Single	39 (68)	18 (32)	0.914	0.30
Married	114 (75)	38 (25)		
Duration of Farm Practice				
2-10	58 (69)	26 (31)		
11-20	52 (74)	18 (26		
21-30	36 (78)	10 (22)	1.477	0.68
31-40	7 (78)	2 (22)		

The only statistically significant relationship between Pesticide use and knowledge of farmers is their level of education. While all other indicators are insignificant as shown on table 4

IV. DISCUSSION

In this study more than half of the farmers know the health risk of pesticide to human, animals and environment as shown on table 1, though few among them either don't know or were uncertain. These could be those that knew might have been exposed directly or indirectly through a friend, family or relation or might have read about it for those that can read, while for those that don't know might be, they have never been encountered with any of the above listed or have bias the study by not proving the right answer. Therefore a study done to assess the health and environmental impacts of pesticide in Ekiti state, Nigeria had a similar result with majority (91%) know the effect of pesticide poisoning but suffered from pesticide-related health

symptoms during or after application of pesticides. (Oluwafemi *et al*., 2009), another study among farmers in Oyo state Ibadan had a similar result also with majority (84.0%) having good knowledge of pesticide use. (Oridupa *et al.*, 2020) However a study among farmers in India reported a poor knowledge of pesticide use (Priyanka *et al*., 2022), another study with a poor knowledge of pesticide use is that of Dawanau International grain market, Kano State Nigeria. (Adegbola *et al*., 2016)

Our findings also revealed that majority of the farmers know the routes of pesticide exposure, except for some very few farmers as reported on table 2. This might be because of their level of education, (more than 90% had certificate or without formal education), and minute exposure through food and water might not be felt immediately compared to skin, nose, & eyes that is felt immediately. As such most farmers neglect exposure through food and water, thus this report is not in line with that of (Thredgold *et al*., 2019) where most of the respondents were reported to know the oral route of exposure but considerable majority were unaware of other routes of exposure such as skin and respiratory tract. However it is similar to a study done to assess the knowledge, attitude, and practice of farmers on pesticide use and their impacts on the Environment and human health in Ethiopia which revealed that only 17% of the farmers lack knowledge of any route of exposure to pesticides. (Mekuria *et a*l., 2021)

Moreover in this study as revealed on table 3, all the farmer were reported to know the symptoms associated to pesticide exposure. Majorly Sneezing, cough or sore throat, skin irritation, nausea and blurred vision, and only about 5% was reported & diagnosed in the health facility, where one case was diagnosed to be cancerous and more than 90% don't report to health facility when they ware expose to pesticide to seek for medical advice rather engage in self-medication which might also be due to distance to health facilities or economic factors (resource for consultation, drugs etc.). This report is not in line with (Priyanka *et al*., 2022) a study done in india where they reported about 37.4% don't know about the diseases that are caused by pesticide. This case that was diagnosed to be cancerous could be because that, the farmer had been mixing & spraying pesticide without PPE, storing food or drinking water in empty pesticide container, storing the pesticide in his living room and it might not been early reported to the heath facility to seek for medical advice. As such this report is similar to the findings reported by the study conducted in Tanzania (Lekei, *et al*., 2014). It was observed that most of these farmers who had symptoms, engaged in self-medication, hile in some the symptoms dis-appear on its own without any medication. Thus the severity of any health effect from pesticide poisoning depend on the dose, the route of exposure, how easily the pesticide is absorbed, the type of effect of the pesticides and its metabolites, the accumulation and persistence in the body and lastly, the health status of the individual, which may be acute, showing immediately after the exposure, or chronic, showing only after prolonged us. (WHO, 1990)

The statistically significant relationship as reported on table 4, between the farmers knowledge with level of education, was found to play a significant role considering that over 70% were farmers who had only certificate or no formal education, as such could have led to the bad attitude and practice, therefore this report is not in agreement with (Sosan and Akingbohungbe, 2009, Berni *et al*., 2021 & Karunamoorthi *et al*., 2012), who established in a previous studies where only farmers with a good level of education tend to have good safety awareness and attitude toward pesticide handling.

V. CONCLUSION

The result from this study has shown that the studied farmers know the health risk of pesticide & routes of exposure to human, animals and environment, also there was a strong association with their level of

education. However the knowledge regarding handling of pesticides was not good especially the use of PPE. Thus all farmers were aware of the symptoms of health problems associated with pesticide exposure but only few farmers were exposed in the study and symptoms were not adequately reported to health care providers. One person was reported to have been diagnosed with cancer.

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