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PESTICIDES USAGE AND HANDLING PRACTICES BY PEASANT FARMERS IN MAIDUGURI, BORNO STATE, NIGERIA

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ABSTRACT

A survey to appraise handling practices, attitude and ill –health symptoms associated with pesticides usages and their adverse effects in the field was conducted in 2016 in Maiduguri metropolitan and environs. The surveyed area was zoned into seven (7) namely, Bolori, Bulumkutu, Gamboru custom, Gwange, Mairi, University of Maiduguri campus and Wulari. Data were collected with the aid of a structured questionnaire administered to 120 cross section of peasant farmers, using purposive sampling method. The data generated were analyzed using descriptive statistics (frequency distribution and percentages). The study revealed that majority of the farmers (83.33%) were within the age of 30 years and above, 31.67% of the farmers had attained tertiary education level; 86.67% of them were involved in handling pesticides over the duration of 2-30 years, and 69.17% used partial personal protection equipment during pesticides applications. Herbicides and insecticides were the most commonly used pesticides. Some of the farmers (47.50%) indiscriminately disposed the pesticides container after use. About 52% of the respondents observed that the efficacy of the pesticides applied has been decreasing. Most of the respondents (65.83%) used agrochemicals for domestic purpose with 68.34% storing the chemicals indoors. Majority of the respondents (84%) have reported to have suffered from one ill- health symptoms associated with poor pesticides handling. The study showed that apart from the effect of chemicals on targeted pests in the field and storage, disposal of pesticide containers, alternatives use and storage of pesticides among the respondents could constitute hazard for household members, hence the need for intensification of awareness for proper handling of pesticides through public enlightenment to enhance safety.

Keywords: Pesticides; handling practice; ill- health symptom; peasant farmers

INTRODUCTION

Pesticides are toxic in nature to target and non - target species of plants and animals, toxicity of pesticides leaves no margin for careless application or improper storage, handlings and spray operators of severe or fatal poisoning. A significant increase in pesticides use has raised concerns about potentially adverse effects on human health and the environment, particularly in countries where regulations are not strictly implemented and farmers'

knowledge of safe handling procedures is often inadequate (Kalayou and Amare, 2015). Man is almost universally more susceptible than other organisms, often by factor of 20 fold or more. It is estimated that about one to three million people were being poisoned annually (Singh and Mandal, 2013). However, most peasant farmers in the developing country like Nigeria use pesticide without basic knowledge of their impact on human health and the environment (Oluwole and Cheke, 2009). Most of them only consider pesticides as one of the vital tools available for effective and quick management of crops from diseases, insect pests and weeds. As a result, farmer's decisions on what pesticides to use and how to use do not have a bearing on health or safety considerations, but rather based applications on calendar spray pesticides program of some crop and household treatment of domestic pests, without necessarily giving much priority to their health and environmental considerations (Osibanjo, 2001; Oluwale and Cheke, 2009). Just like in the 1950s, the application of pesticides in agriculture was considered advantageous, and no concern about the potential risks of these chemicals to the environment and the human health existed at that time (Gyawali, 2018). Because most small scale farmers used pesticides without adequate knowledge or access to information on safety tips about pesticide handling or formal training on pesticide management. Majority of the farmers suffered from at least one ill-health symptom associated with pesticide handling (WHO, 1990). Nevertheless, pesticides are the most effective tools available for the control of weeds, insects and diseases, and to improve the quality of the food produced (Damalas, 2009), but it requires special care and handling, because of the risk that other household members and the wider local community are exposed. There is a general lack of accounting for hidden costs of pesticide application to non-target organisms, human and the environment. Pesticide poisoning cases are under reported by 50% to 80% region wide in Americas, according to Pan American Health Organization, an international public health agency based in Washington D.C. (Gyawali, 2018). Similarly, no reliable statistics about pesticide intoxications in Maiduguri exists because farmers usually do not seek medical advice hence the cases of pesticide intoxications are not recorded.

This study was carried out to explore the various issues related to pesticide handling practices, attitude, and usage by vulnerable farmers potentially exposed to the chemical, as well as to identify reasons why health and environmental problems associated with pesticides usage are usually blamed on the pesticides without considering how they are handled and applied by the consumers.

METHODOLOGY

Study Area

This study was conducted between May and August 2016 and constitutes a cross-sectional survey of farmers using pesticides within Maiduguri metropolis and environs. The study area was divided in to seven locations, namely; Bolori, Bulumkutu, Gamboru custom, Gwange, Mairi, University of Maiduguri campus and Wulari. The distribution of number of respondents by location were 14 (11.67%) at Bolori, 16 (13.33%) at Bulumkutu, 23 (19.17%) at Gamboru custom, 17 (14.17%) at Gwange, 17 (14.17%) at Mairi, 15 (12.50%) at University of Maiduguri campus and 18 (15.00%) at Wulari. Maiduguri is located on latitude 11.85^0 N and longitude 13.08^0 E with an altitude of 324m above sea level, Maiduguri fall within the semi-arid zone of West Africa geographically and it experiences little rainfall and

more of dry season (Abdulrahim *et al*., 2012). Majority of the inhabitant are either farmers or traders and agriculture is the main source of living and economy, with other engaged in trading and white-collar jobs. Most of them were peasant and small-scale, predominantly operating under subsistence level. The major crops cultivated by the peoples includes groundnut, cowpea, millet, sorghum, vegetable crops and rearing of livestock.

Sampling and Sample Size

Purposive sampling technique was used in the selection of the respondents. Individuals are selected based on the assumption that they are working with pesticides. A pilot survey was conducted for familiarization of the study area. Information on the most important locations where farmer workers using pesticides were mostly residing was acquired. This led to the selection of the seven locations across Maiduguri metropolis and environs for this study. 120 active farmer respondents were reached purposively because of their presumed relevance to the study in the different locations, in a non-random manner where sampling proportionally was not the main concern.

Data Collection and Analysis

Data were collected via a structured questionnaire. The questionnaire consists of five sections on farmers socio-economics characteristics, pesticide handling, application practices, other usage of pesticide, ill health symptom observed and environmental hazards. The data collected were coded and analyzed using descriptive statistical measures. The measures used for the analysis are frequency distribution tables and percentage.

RESULTS AND DISCUSSION

Socio-economic Characteristics of Respondents

The distribution of households according to socio-economic characteristics of respondents is shown in Table (1) Age distribution of the respondents shows that 16.67% were within 20- 30 years' group, 33.33% were within 31 – 40 years' category while the rest of the respondents 50% were within age of 41 -60 years. Most of the farmers were people from the age of 31 years and above. This mean the younger generations are not much interested in farming. Although, spraying of pesticides on the farms are mostly carried out by the youths below the age of 30 years. This suggests that there are higher risks of coming in contact with chemical by the younger than by the older generation in the study area. The results also show that 62.5% of the farmers were male and only about 37.5% were female. The low number of female farmers may be as a result of domestic activities which keep them indoors. This implies that the men are relatively more likely to come in contact with pesticides than the women. This is in line with the findings of Mansingh *et al.* (2003) who also noted that pesticides are usually applied by male workers. Most farmers in the study area (74.17%) were involved in farming for more than 10 years and above, whereas the others (25.83%) were involved between 2 and 10 years. The results further revealed that 16.66% of the respondents had secondary school education, 31.67% had tertiary education whereas 5% had primary school education and 19.17% had adult education while 27.05% had not received any formal education (Table 1). The study revealed that the respondent's educational levels

and experience in farming or number of years in farming had little or no significant influence, on the safety handling and use of pesticides in their various activities, involving either in the farm, storage or other domestic use of pesticides in the community knowingly or unknowingly. Thus, training on pesticide management may play a significant influence at least in some level of adoption of safety practices and PPE use by the farmers in the study areas if applied. Because little or no evidence of farmer training in pesticide handling and safety initiatives among the farmers in the study area exists. Hence no one took precautions unless they knew about the precautionary measures (Yassin *et al*., 2002).

Table 1: Socio-economic characteristics of respondents using pesticides in Maiduguri Metropolis and environs (n = 120)

Variables	Frequency	Percentage (%)
Age in year		
21 – 30	20	16.67
31 – 40	40	33.33
41 – 50	45	37.50
51 and above	15	12.50
Gender		
Male	75	62.50
Female	45	37.50
Tenure in farming (Years)		
2 – 10	31	25.83
11 – 20	40	33.33
21 - 30	33	27.51
31 and above	16	13.33
Educational level		
None	9	7.50
Qur'anic	24	20.00
Adult education	23	19.17
Primary	6	5.00
Secondary	20	16.66
Tertiary	38	31.67

Farmers Attitude toward Pesticides Handling Practices, Storage and other Usages

47.5% of the respondents, reported having used personal protection equipment (PPE) when mixing and spraying pesticides, whereas 35.83% and 16.67% respondents reported using PPE occasionally and not at all, respectively (Table 2). The pieces of PPE reportedly used by most farmers were polythene bag as hand gloves and pieces of clothes to cover the mouth and nostrils during pesticide mixing and application. Generally, several cases of farm workers not properly using PPE during pesticides handling and application were also reported by other researchers (Yassin *et al*., 2002; Salameh *et al*., 2004: Oluwale and Cheke, 2009). Hence, there is need for occupational safety in the study area, on basic education and promotion of pesticides safe handling by farm workers.

Majority of the respondents (79.17 %) reported that they do not drink, eat or smoke when working with pesticide, whereas 15.67% respondents their reported that they do drink eat or smoke sometimes, followed by 9.17% respondents reported that they always drink, eat

and smoke in the farms when handling chemical (Table 2). Although majority of the respondents do not drink, eat or smoke when working with pesticide, but generally among the farm workers who had long experience with pesticide application often take fewer preventive measures, because they believed that their bodies endured to pesticides exposure. These findings are consistent with the reports of Yassin *et al*. (2002) that some farm workers believed that their bodies have developed resistance against pesticides. But several studies have highlighted the occurrence of acute and chronic poisoning with varying severity index on human health and ecosystem (Jallow *et al*., 2017; Larramendy and Soloneski, 2019).

Most respondents (74.17%) agreed that instructions by manufacturer for pesticide use must be adhered to, whereas lower proportion of the respondents (25.83%) said not always, because the efficacy of the pesticides they applied in managing the target pests and diseases would be less effective occasionally if they followed the instructions of the manufacturer strictly (Table 2). This suggests that such farmers were compromising the safety handling and usage of pesticides. This might play a role in the development of resistance of pests and diseases to pesticides, with the pesticides used by the farmers becoming less effective overtimes and leading to high incidence and severity of pests and diseases.

About 34% of the respondents, with respect to site of storage of pesticides result shown that they store pesticides in a shade outside the house, 33.33% at nearby garden close to their house, 23.33% in the toilet, 5.00% in the sitting room, 4.17% in bedroom while none among the respondents kept pesticides in the kitchen or cooking places (Table 2). Storing of pesticides within their household premises, may lead to broader members of the household to pesticides exposure, than the number of farmers directly working with the pesticide in the fields. Particularly, children are more endanger to acute and chronic exposure to pesticides (Jallow *et al*., 2017). Since most pesticides can persist in the environment, they can remain there for longer periods, and can expose the household members to pesticide residues, including physical and biological degradation products present in the air, water and food (Mostafalou and Abdollahi, 2013). Pesticide safety education is necessary in order to create awareness among the farmers on pesticide side effects if not properly handled and stored before and after use within the household premises.

A total 35% of the farmer, reported that they use agrochemicals to kill mosquitoes and flies, whereas 17.50% used to control rodents, 12.50% to kill cockroaches, 1.67% to control lice and ticks whereas 33.33% of the respondents used the agrochemical for different alternative domestic uses to control other pests such ants, bedbugs, spiders and termites (Table 2). Unsafe use of pesticides is common in most developing countries (Salameh *et al.*, 2004), despite their known toxicity. This study shown that majority of the respondents up to 66.67%, reported that they use agrochemicals to kill mosquitoes, cockroach, flies, lice, ticks and rodents. Apart from the occupational exposure to pesticide during storing, mixing, loading, transporting and spraying pesticides in the farm, the practices of alternatives use of pesticides for domestic purpose in the study area is rampant, which may predispose them to higher intoxication risks than the general application of pesticides in the field. This finding concur with Kumar *et al*. (2012) who reported that all pesticides have the potential to be harmful to humans, domestic animals, other living organisms, and the environment if used incorrectly. In most developing countries, like Nigeria, there is probably no home where agrochemicals are not used to control domestic pests such as mosquitoes, cockroaches, termites, ants, rodents etc. (Ojo, 2016).

Table 2: Distribution of respondents according to attitude towards pesticides handling practices, storage and other usage (n = 120)

Variables	Frequency	Percentage (%)
Using personal protection equipment when mixing and spraying pesticides		
Always	57	47.50
Occasionally	43	35.83
Not at all	20	16.67
Drinking, eating or smoking when working with pesticide		
Always	11	9.17
Occasionally	14	11.67
Not at all	95	79.16
Instructions for use of a given pesticides must be strictly followed		
Agree	54	45.00
Strongly agree	35	29.17
Occasionally	31	25.83
Disagree	0	0.00
Site of storage of pesticides		
Shade outside the house	41	34.17
Nearby farm	40	33.33
Toilet	28	23.33
Sitting room	6	5.00
Bedroom	5	4.17
Kitchen	0	0.00
Alternative uses of pesticides		
Killing flies and mosquitoes	42	35.00
Killing rats and birds	21	17.50
Killing cockroaches	15	12.50
Killing lice and ticks	2	1.67
Ants, bedbugs, spiders and termites	40	33.33

Factors Related to Pesticides Application and Handling Practices

About half (54.17%) of the respondents, with respect to the type of pesticides frequently used, reported applying herbicides, 37.50% applied insecticide, 5.83% applied fungicide and 2.50% applied nematicide (Table 3). The farmers frequently use herbicides, compared to other pesticides, because weeds were most serious threats to crop cultivation in the study area. Similar findings were reported by Oluwale and Cheke (2009) in South western, Nigeria. These findings are consistent with the reports of FAOSTAT (2018) that among the different classes of pesticides, the highest pesticide used are herbicides (49%). 40% of the respondents indicated that they practiced foliar application of pesticide, 32.5% used seed dressing whereas 27.5% used fumigation in storage (Table 3).

Table 3: Distribution of the respondents based on common types of pesticides, methods of application, disposal, cleansing of equipment and type of sprayer used (n = 120)

Variables	Frequency	Percentage (%)
Types of pesticides		
Insecticide	45	37.5
Fungicide	7	5.83
Herbicide	65	54.17
Nematicide	3	2.50
Methods of application		
Seed dressing	39	32.50
Foliar application	48	40.00
Fumigation	33	27.50
Number of application		
Once/season	20	16.67
Twice/season	42	35.00
More than twice/season	58	48.33
Method of disposal of pesticide containers		
Throw away	57	47.51
Burnt and bury	49	40.83
Put to other uses	14	11.67
Places where equipment are washed		
With water in the field	71	59.17
With water in the house	37	30.83
With water from river, lake and pond	12	10.00
Types of sprayer used		
Knapsack sprayer	72	60.00
Hand sprayer	17	17.00
perforated containers, bottles and tree leaves	31	23.00

With respect to number of applications per season, 48.33%) of the respondents reported that they applied the pesticide more than twice per season, the excessive use of pesticides in the study area has generated negative effects on human health and the environment. This probably could be the main cause of several ailments reported by the farmers after field work in the study area. Although 35% used pesticides twice per season while 16.67% sprayed only once per season usually herbicide, but many researchers had confirmed that pesticides were the main cause of negative effects on human health and the environment (Yassin *et al*., 2002; Olowe and Cheke (2009; Jallow *et al*., 2017). 47.51% of the respondents indicated that they throw away the pesticide's containers and sachets in dustbins or in the environment, 40.83% of the farmers reported that they burnt and bury the pesticides container after use, whereas 11.67% of the respondents indicated that they use the container for other domestic purpose (Table 3). Such practices could put the general public at risk associated with pesticide poisoning and various other form of pesticide hazards to the whole community. The disposing of pesticides containers in the garbage sites or along the street was considered as one of the major problem of pesticides management and usage in developing countries (Wesseling *et al*., 1997; Yassin *et al*., 2002). It is likely that pesticide containers usage and disposal of pesticide sachets by the farmers and its side effects will

continue to increase in the study area, because traders in the local market even purchase pesticides containers from the farm workers and sell it to any prospective customer, possibly for storage of liquid and other edible materials. Majority of the respondents washed sprayer and other equipment after pesticides spraying in the farm (59.17%), 30.08% of the respondents washed in their houses, while 10% washed with water from rivers, lakes and ponds nearest to their fields. thereby posing serious health hazard to farmers, their families, other domestic and wild animals. Most farmers (60%) used knapsack sprayer and 17% used hand sprayer, whereas 23% of the farmers used other means of spraying pesticides like perforated containers, bottles and tree leaves, this form of application could expose the whole household to pesticide hazards (Table 3).

Ill-Health Symptoms Related to Pesticides Handlings and Usage Among Farmers and Effects on the Environment

The entire respondents reported at least one case of ill-health symptom encountered during pesticides usage. 24.17% farmers reported having experienced dizziness and skin irritation, 21.67% reported vomiting and salivation.

Table 4: Distribution of the respondents according to cases of ill-health symptoms encountered due to pesticides use and effects on the field environment (n = 120)

Variables	Frequency	Percentage (%)
Experienced ill-health symptoms	84	70.00
Did not experience any symptoms	36	30.00
Major ill-health symptoms experienced		
Vomiting and salvation	26	21.66
Headaches and burning sensation in the face	26	21.66
Fatigue and general weakness	14	11.66
Dizziness and skin irritation	29	24.16
Running nose and difficult breathing	18	15.00
Diarrhea and abdominal cramp	5	4.16
Others symptoms	3	2.50
Observed changes on effectiveness of pesticides application in the field	98	81.67
Effective changes observed	22	18.33
No effective changes		
Observation of field pest condition		
Target pest has been reducing	94	78.33
The field is in need of more pesticides because of new pests	26	21.67
Opinion about efficacy of pesticide over the years		
The efficacy has been increasing	58	48.33
The efficacy has been decreasing	62	51.67

Similarly, 21.67% reported headache and burning sensation in the face, 15% reported running nose and difficult breathing, 11.67% reported fatigue and general weakness, and 4.17% reported abdominal cramp and diarrhea (Table 4). Although the symptom observed in

this study mostly fall into the category of moderate pesticide poisoning (WHO,1990), but occupational or non-occupational low dose exposure to any pesticides causes chronic diseases in human and can be considered as silent killers (Ganguly and Sigh, 2018). About of 88% of the respondents reported that they observed changes due to pesticides application on their farm whereas 18.33% reported that they did not observe changes due to pesticides application on their farm. Majority of the respondents (78.33%) indicated that target pests has been reduced in the farm, whereas 21.67% of the respondents indicated that the field was in need of more pesticides because of emergence of new pests (Table 4). Many studies have highlighted that excessive use of pesticides may lead to destruction of biodiversity, secondary pest outbreaks, decline in predator species population, destruction of non-target species and development of resistance of insect pest and disease to pesticides (Vostrel, 1998; Ntow, 2001; Recena *et al.*, 2006).

More than 48% of the respondents reported that they observed the efficacy of pesticide over the years has been increasing. whereas 51.67% observed decline in the efficacy of pesticides over the years (Table 4). higher frequency of pesticides application pattern facilitates the establishment and perpetuation of pests and diseases, particularly, when farmers were compelled to use more and more pesticides in the farms as they lost potency and efficacy overtime (Ojo, 2016).

CONCLUSION

In conclusion, no segment of the population is completely protected against exposure to pesticides and its potential serious human health and environmental effects in the study area. It is often difficult to ascertain in a population where all sorts of pesticide are indiscriminately used in the control of both field and domestic pests in residential areas, which could constitute significant exposure pathways for humans. This study has identified many pesticide handling information gaps, in terms of safety, storage and handling. This showed that fields spraying, alternative use and inappropriate storage of pesticides among the peasantry, constitute disaster for both farmers' household and the local community at large. Many pesticides can be safely and effectively used when handling instructions are followed. Thus, pesticide safety education is necessary in order to inculcate protective attitude among farm workers, to understand both basic and consequential aspects of the use and misuse of pesticides, specific health conditions which may be traced to pesticide intoxication and to repudiate the erroneous beliefs of the farmers that they are resistant to pesticide poisoning should be intensified through public news media to enhance safety and proper use of pesticide among the farmers. Since the farmers seem to be unaware of potential risks and lack pesticide safety education. Government intervention is needed to ensure proper legislation regarding public health risks and hazards in occupational and general pesticides safety measures in the study area.

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