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Comparative Assessment on the Knowledge, Attitude and Practices of Lafia Metropolis Residents on the use of Dichlorvos in Lafia, Nasarawa State, Nigeria

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Abstract

The widespread use and misuse of dichlorvos, an organophosphate insecticide presents an important environmental and ecological problem in Nigeria. The use in both urban and rural areas against insects in residences, farms and storage facilities takes place within Lafia metropolis affecting both target and non-target insect species, and other animals including humans. The aim of the study was to assess the knowledge, attitude and practices of residents of Lafia metropolis on the use of dichlorvos which is one among the numerous pesticides available in the open market. Data collection was achieved using a validated questionnaire distributed in four selected locations within Lafia metropolis in May 2021 and June 2023. Results showed that out of a total of 2,857 respondents, 1,392 (97.62%) had known dichlorvos in 2021 out of which 1,094 (78.59%) had used it themselves, while 1,422 (99.37%) had known dichlorvos in 2023 out of which 1,217 (85.58%) had used it indicating a significant increase in the period of study ($p<0.05$). Results also indicated that respondents learned to use dichlorvos majorly from family and friends in 2021 and 2023 ($p<0.05$; $p=0.0014$), while they applied it to farms, storage facilities and homes ($p<0.05$; $p=0.0063$) without protective clothing ($p>0.05$; $p=0.219$). Though the respondents indicated willingness to be trained on the proper use of dichlorvos ($p<0.05$; $p=0.0397$), the study further recommends constant monitoring of the distribution and sale to minimize any increase in dichlorvos misuse, which can impact negatively on the human health and environment.

Keywords: Assessment, Knowledge, Practice, Metropolis, Dichlorvos, Lafia.

Introduction

The continuous quest for development via industrialization and urbanization in the past years has led to a series of increase in environmental contamination from different chemical sources (Ombugadu *et al.*, 2023), some of which are from agrochemicals which are pesticides used to control pests and enhance agricultural productivity to ensure food security (WHO, 2017; Yusuf *et al.*, 2017). People often use the term "pesticide" to refer only to insecticides, but it actually applies to all the substances used to control pests (Zhang *et al.*, 2021). Insecticides are chemical substances used to kill insects which can be used against insect eggs and larvae. Furthermore, they are described as chemicals used to control insects by killing them or preventing them from engaging in undesirable or destructive behaviours (US EPA, 2021).

Unfortunately, the effect of the use of such agrochemicals and their residue on non- target organism were not fully considered (Omitoyin *et al.*, 2006), but the effect of these chemicals

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on non-target organisms is an issue of concern (Hassan and El Nemr, 2020). The residual toxins can be carried from one place to another, or from one organism to another along a food chain and their role in degradation of the ecosystem cannot be ignored (Jeyaratnam, 1993) as it could be accumulated in the tissues of non-target organisms, thereby influencing their ability to adapt to their environment. In addition, they can also disrupt the natural ecosystem and impact the human body acutely and permanently through the food chain (Ali *et al.*, 2021) and compromise the health of humans generally.

In a developing nation like Nigeria where farming activities are practiced, there is a general acceptance and use of pesticides such as dichlorvos which is an insecticide for the control of insect pest (Yusuf *et al.*, 2017). Unfortunately, this has led to the increasingly indiscriminate use by both trained and untrained persons, thus elevating concentrations in different components of the ecosystem (Yusuf *et al.*, 2017). In addition, careless handling, accidental spillage, or discharges of untreated effluents into the environment which all have harmful effects on aquatic or terrestrial animals, and contribute to long term effects of these hazardous chemicals in the environment like bioaccumulation, as well as the rapid loss of biodiversity (Jeyaratnam, 1993; Odiete, 1999; Ali *et al.*, 2021).

Dichlorvos with an IUPAC name Dimethyl 2,2- dichlorovinyl phosphate and synonyms which include 2,2-dichlorovinyl dimethyl phosphate, DDVP (CERI, 2007) is a contact and oral insecticide with fumigant and penetrant actions, and is categorized as a class 1B organophosphate insecticide which are described as highly hazardous in nature (EPA, 2006). It was a commonly used pesticide globally in the past due to their its reported degradation ability (Deka and Mahanta, 2015), but now restricted or banned in some districts and countries due to its damage to the human nervous system, and concerns over its potential carcinogenic properties (Okoroiwu and Iwara, 2018; Southwark Trading Standards, 2022).

Though dichlorvos has many trade names (Deka and Mahanta, 2015), it is quite popular under the name 'Sniper' among other brand names. It is among the frequently used insecticides in Lafia metropolis and the neighboring peri-urban communities for the control of insect pest and other arthropods on both farms and in storage facilities (Yusuf *et al.*, 2017). Like other major cities of the North-Central zone of Nigeria, the people in Lafia metropolis stand the risk of the accumulation of dangerous levels of this chemical in the environment by the large volumes of dichlorvos indiscriminately distributed and sold in the open market to residents, most of whom lack proper formal training on the safe use strategies which can negatively impact the quality of life and public health of humans (Okoroiwu and Iwara, 2018).

To this end, this study aimed to assess the level of knowledge, attitude and practices of Lafia residents on the use of dichlorvos sold in Lafia metropolis, Lafia, Nasarawa state within the study period.

Materials and methods

The study was carried out as a descriptive survey which employed random sampling technique for data collection with the use of a structured questionnaire as described by Manjunatha (2019). A descriptive research survey deals with the investigation of the status of things or the relationship existing between current events and situations (Chatfield, 1982). This study was concerned with the collection of data for the purpose of describing and interpreting existing conditions, the prevailing practices, beliefs, attitudes and any other ongoing process related to the use of dichlorvos in Lafia. The descriptive approach was also employed to objectively monitor systematic procedures to measure human behaviour of the residents in the study area (Kothari and Garg, 2014; Manjunatha, 2019).

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The study was conducted in Lafia located in Lafia Local Government Area of Nasarawa state and is located in the north-central geopolitical zone of Nigeria. It is the state capital of Nasarawa state with a total land area of 2,827km2 and is located between latitude 8o 29”N and longitude 8o 51”E (Ombugadu et al., 2023). Four selected locations for the study include Doma road and Makurdi road in 2021 while Shendam road and Jos road were sampled in 2023.

The instrument used was developed based on the main variables of the study. The questionnaire was divided into two sections: A and B respectively with section A comprising personal data of the respondent such as gender, age, education and occupation; section B comprised of fifteen statements in the form of questions which concern the variables of the study. To address the variables in the study, the respondents were asked to select either the ‘YES’, ‘NO’ or any other relevant options against each question that is perceived as most appropriate to them. The instrument was validated by experts from the Department of Sociology, Federal University of Lafia. The reliability of the instrument was established by adopting the test - retest method in a presurvey after which the necessary corrections were made on the instrument.

Data obtained from the descriptive survey were analysed by chi square test using Microsoft Excel (office 2019) and compared between the years statistically. The values $P < 0.05$ were considered statistically significant.

Result and Discussion

A total of 2,857 respondents participated in the survey out of 2,880 questionnaires distributed in the four locations in Lafia metropolis, Nasarawa state during the period of study. In May 2021, 1,426 out of 1,440 respondents were participants while in June 2023, 1,431 out of 1,440 respondents participated successfully. Demographic data of the respondents for 2021 and 2023 are shown in Figures 1 and 2 indicating no significant difference (P=0.892) between the different periods of data collection. However, results show the percentage of male to female which was 51.6% and 48.4% in 2021, while 50.9% and 49.1% in 2023. This slightly differs from the projections of Brinkhoff (2022) who projected males to be 50.2% and females to be 49.8% based on the future projections of the 2006 National Population Census.

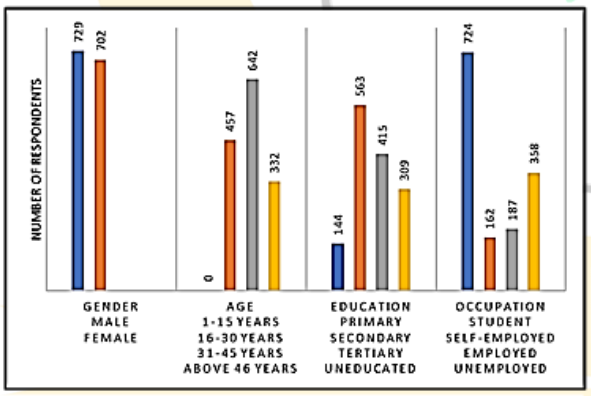

Figure 1: 2021 Demographic data of Respondents in the Study Area

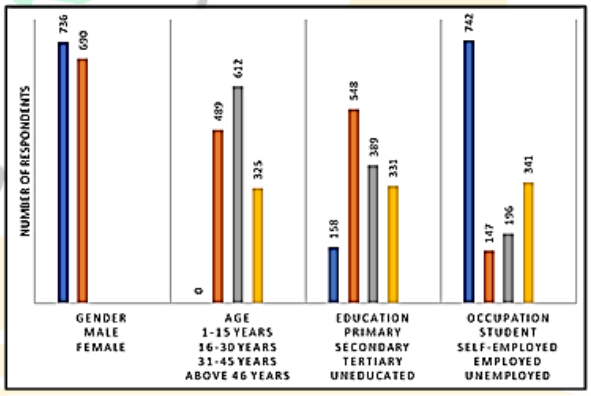

Figure 2: 2023 Demographic data of Respondents in the Study Area (p=0.892)

Demographic data show that individuals aged 31–45 years constituted the largest proportion of respondents, accounting for 42.9% in 2021 and 44.8% in 2023. This variation may be influenced by factors such as the timing, day, or season of data collection, as well as lower female participation. These findings align with Onuoha (2016), who reported that the primary economic activities in the area include the cultivation of cash crops such as yam, cassava, rice, melon, maize, cowpea, groundnut, vegetables, millet, guinea corn, sesame, and sugar cane alongside fish farming and mining.

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Figures 3 to 17 shows the results of respondents in the study area to various questions on their knowledge, attitude and practices on the use of dichlorvos. All respondents indicated having knowledge of pesticides and its types with herbicides, insecticides and rodenticides being the most commonly known as seen in figure 4. While over 97.0% of respondents recognized dichlorvos by its market name, only 76.7% reported using themselves in 2021 while 85.0% used it themselves in 2023 indicating a significant difference between the period of study shown in figures 5 and 6 respectively. Abaukaka et al. (2020) reported that dichlorvos has been widely used and abused in different regions, especially the northern part of Nigeria for several reasons. The indiscriminate application on farms and farm produce, topical application to combat ectoparasite infestation and even for suicide attempts are generally on the rise due to increased access by individuals. This is also in agreement with findings of Yusuf et al. (2017) who advocate for improved measures to combat the use of this banned pesticide in our environment.

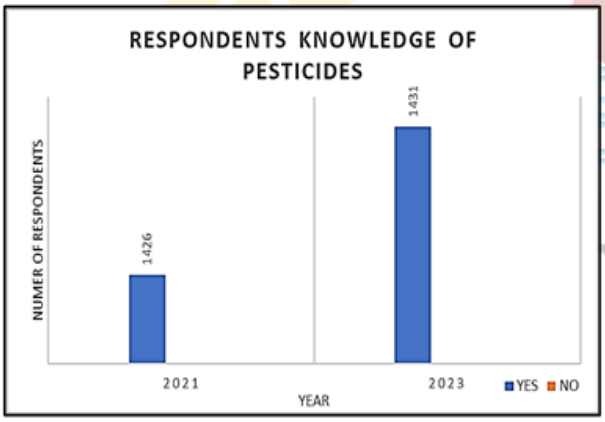

Figure 3: Response to Question one from the study area (p=0.487)

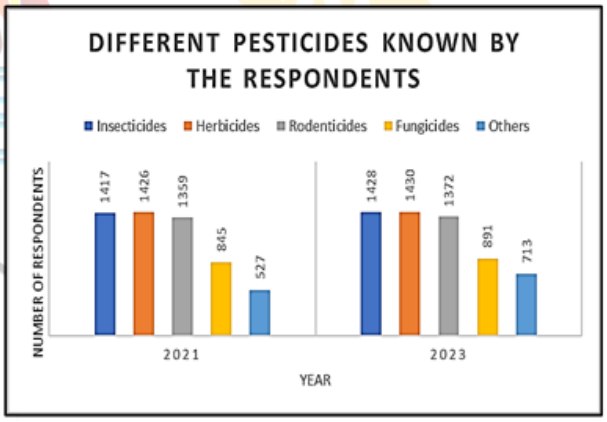

Figure 4: Response to Question two from the study area (p=0.182)

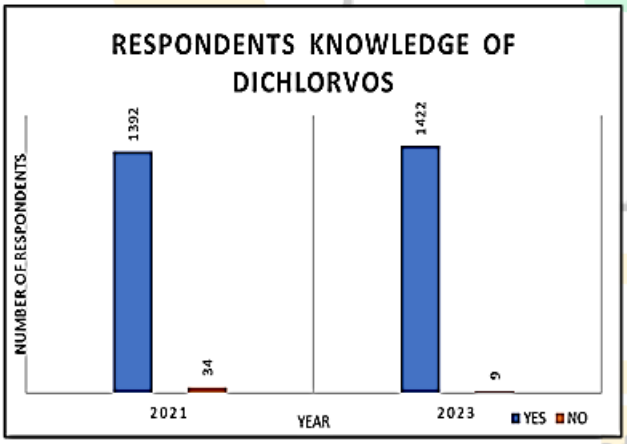

Figure 5: Response to Question three from the study area (p=0.0035)

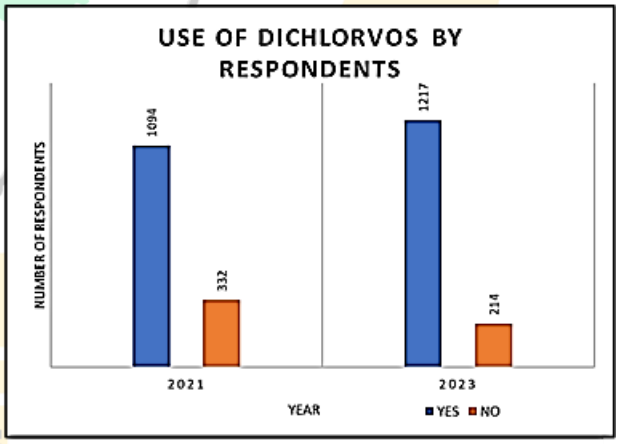

Figure 6: Response to Question four from the study area (p=0.0007)

By practice, figure 8 showed respondents reported learning to apply dichlorvos mainly from family and friends in both 2021 and 2023 indicating an increase while learning from professionals recorded the lowest in 2021 and further reduced in 2023 indicating significant differences. This implies there is a growing gap of knowledge on the proper use of dichlorvos, lack of adequate training and retraining opportunities for end users. The untrained or semi trained persons therefore fill in this gap (Abaukaka et al., 2020). Furthermore, 40.1% reported

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using dichlorvos 3 -5 times a year and the trend maintained in 2023 indicates the importance of the insecticide to users for their various activities (US EPA, 2021).

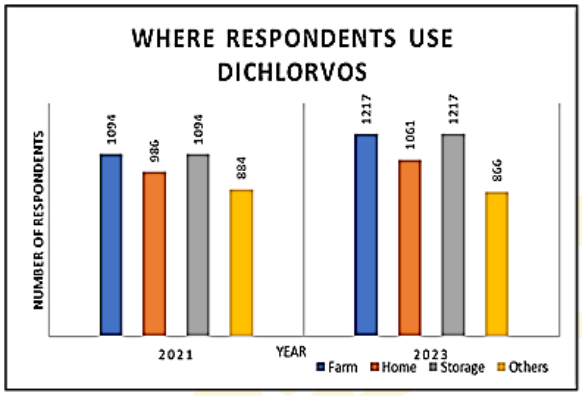

Figure 7: Response to Question five from the study area (p=0.0063)

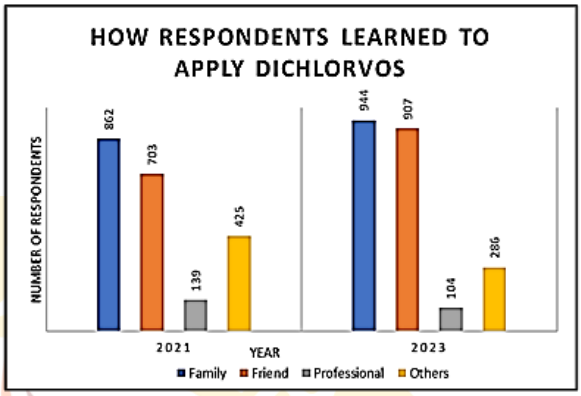

Figure 8: Response to Question six from the study area (p=0.0014)

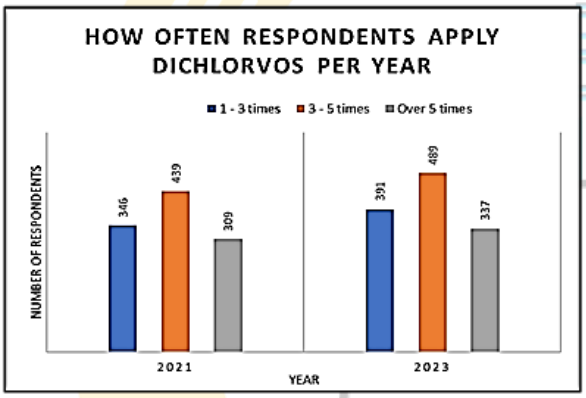

Figure 9: Response to Question seven from the study area (p=0.311)

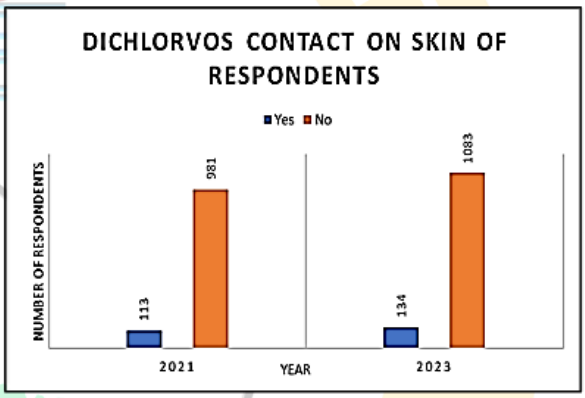

Figure 10: Response to Question eight from the study area (p=0.232)

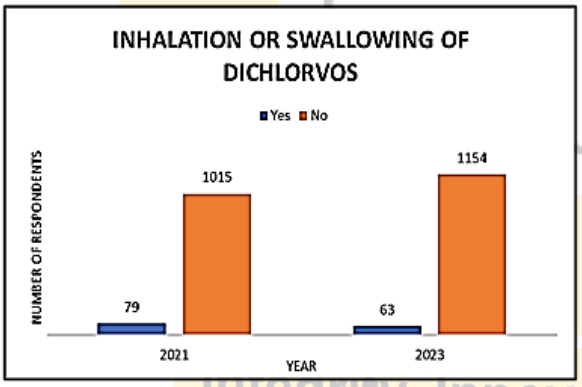

Figure 11: Response to Question nine from the study area (p=0.106)

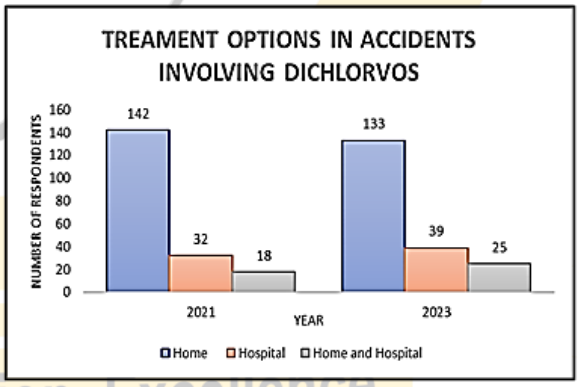

Figure 12: Response to Question ten from the study area (p=0.334)

Though the results show that dichlorvos was most commonly used on farms, in storage facilities, and within homes, as illustrated in Figure 7 however, a majority of respondents (83.6%) in 2021 and (86.6%) in 2023 (Figure 13) reported not using standard protective clothing, with no statistically significant difference between the two years, indicating a trend that shows the users do not attach any importance to the use of standard protective clothing.

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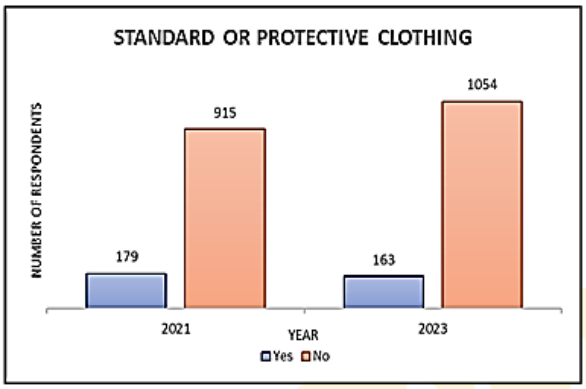

Figure 13: Response to Question eleven from the study area (p=0.219)

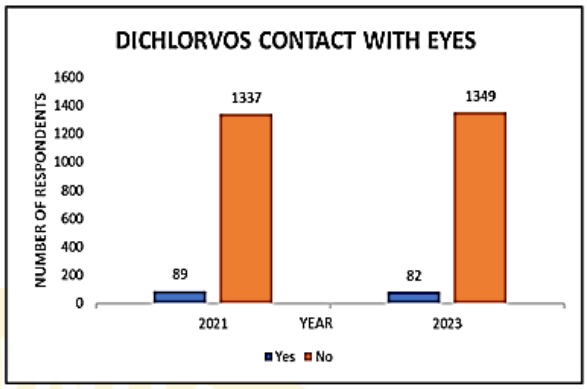

Figure 14: Response to Question twelve from the study area (p=0.633)

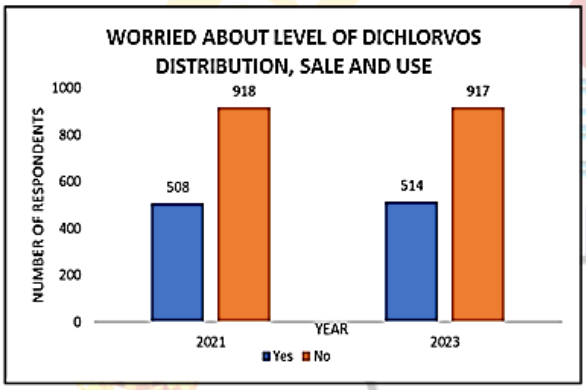

Figure 15: Response to Question thirteen from the study area (p=0.932)

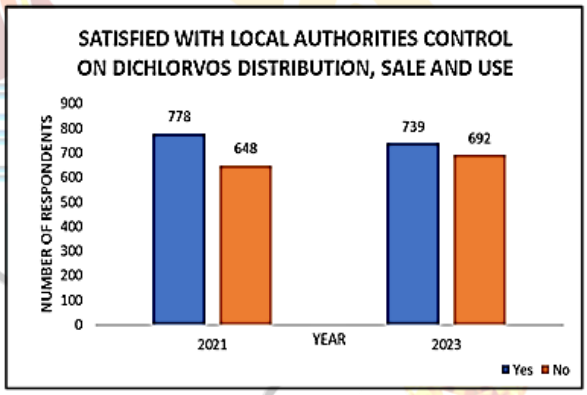

Figure 16: Response to Question fourteen from the study area (p=0.267)

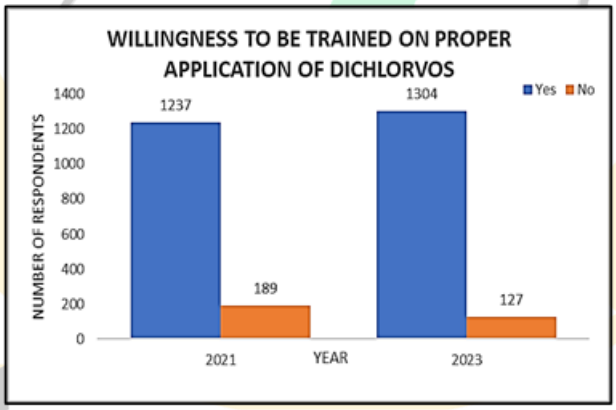

Figure 17: Response to Question fifteen from the study area (p=0.0007)

This is in agreement with Yusuf et al. (2017), while despite more than 83% of respondents expressing little concern about the distribution, sale, and use of dichlorvos (Figure 15), 86.7% indicated a willingness to receive training on its proper use (Figure 17). This finding is however in contrast to Abaukaka et al. (2020) who reported an unwillingness of users of dichlorvos to properly trained if granted the opportunity. This is in agreement with Yusuf et al. (2017) that reported the poor management practices associated with dichlorvos usage by the end users and lack of campaign strategies by the regulatory authorities.

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Conclusion

The present study has indicated that the knowledge, attitude and practices of Lafia residents on the proper use of dichlorvos against insect pests is lacking among many residents in the study area. The requisite knowledge on the appropriate ways to handle such a toxic organophosphate insecticide in terms of its licenced distribution, sale in the open market, application and disposal are critical to preventing environmental contamination and pollution, as well as maintaining an optimum public health profile of residents in Lafia. Therefore, the urgent need for the regulatory authorities to ensure quality monitoring of the distribution and sale of dichlorvos in every district of Lafia to minimize any misuse is crucial, in addition to sensitization training of residents on the proper use of this insecticide will go a long way to reduce contamination levels in the environment. Further research should be conducted to ascertain the level of contamination in the environment on both target and non-target organisms.

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Conflict of Interest

Authors have declared that there is no conflict of interest.

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