Effects of Teaching Health Care Workers on Diagnosis and Treatment of Pesticide Poisonings in Uganda

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ABSTRACT

BACKGROUND: Acute pesticide poisoning in developing countries is a considerable problem, requiring diagnosis and treatment. This study describes how training of health care workers in Uganda affects their ability to diagnose and manage acute pesticide poisoning.
METHOD: A postintervention cross-sectional study was conducted using a standardized questionnaire. A total of 326 health care workers in Uganda were interviewed on knowledge and handling of acute pesticide poisoning. Of those, 173 health care workers had received training, whereas 153 untrained health care workers from neighboring regions served as controls.
RESULTS: Trained health care workers scored higher on knowledge of pesticide toxicity and handling of acute pesticide poisoning. Stratification by sex, profession, experience, and health center level did not have any influence on the outcome.
CONCLUSIONS: Training health care workers can improve their knowledge and treatment of pesticide poisonings. Knowledge of the subject is still insufficient among health care workers and further training is needed.

KEYWORDS: Acute pesticide poisoning, health care workers, knowledge, treatment, training, developing country

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Background

Acute pesticide poisoning (APP) can lead to severe health problems including possible chronic effects and is a major problem of occupational and public health in developing countries.[1,2]

Symptoms of APP can often be reversed with proper medical attention and prompt treatment, but in cases where these are unavailable, APP can be fatal. Common symptoms of APP include the following: itching and redness of the eyes, skin irritation, coughing, dizziness, and respiratory distress. In case of systemic poisoning, many organ systems may be affected.[1]

In developing countries, APP is an underdiagnosed problem due to health care workers (HCWs) receiving very limited training on diagnosis and management of APP.[1] Furthermore, HCWs have little experience diagnosing and handling patients with APP. These factors leave HCWs insufficiently equipped to give the appropriate care to patients with APP.[1,3]

For this reason, training HCWs is crucial in combating the effects of APP, securing quick and reliable treatment at all levels of health centers.

The Ugandan health care structure is a tiered system, starting with village facilities, followed by health centers in rural and urban settings. Health centers refer upward to health centers at higher levels and finally to hospitals. The health centers range from simple facilities with the barest minimum of staff and available treatments (level II) to fully equipped hospitals. Health care workers responsible for delivering health services at different levels include medical doctors, clinical officers, midwives, enrolled nurses, and nursing assistants.

To increase the level of knowledge in HCWs and to better the ability to diagnose and manage of APP at all health center levels, the Pesticide use, Health and Environment (PHE) project has conducted several training sessions on APP, targeting HCWs in rural and urban areas.

The aim of this study is to assess the effect of PHE training of HCWs by showing which impact training has on knowledge and management of APP in HCWs. A positive outcome of the study enforces the idea that training of HCWs leads to more knowledge and better handling of APP.

Method

Study area and population

The collection of data was conducted from October 2016 to November 2016 in 4 districts in Uganda.

The intervention districts consisted of the semi-urban district Wakiso with a population of 2 007 700[4] with 832 HCWs distributed between 71 health center IIs, 43 health center IIIs, 12 health center IVs, and 6 hospitals,[5] and the rural district Pallisa with a population of 386 074 with 414 HCWs

distributed in 12 health center IIs, 17 health center IIIs, 1 health center IV, and 2 hospitals.[4,6]

The control districts were Mukono, a semi-urban district, with a population of 599 817 with 406 HCWs distributed in 33 health center IIs, 15 health center IIIs, 3 health center IVs, and 1 hospital,[4,7] and Kumi, a rural district with a population of 258 073 people with 275 HCWs distributed in 16 health center IIs, 7 health center IIIs, 1 health center IV, and 3 hospitals.[4,8]

It was a priority of the study to try to reach employees from a variety of professions and to assess the knowledge of those working at different levels of health centers. The study population was HCWs (enrolled nurses, nursing assistants, midwives, medical doctors, and clinical officers) in health centers II, III, IV, and hospitals. Our intervention sample consisted of 173 HCWs out of 467 who received training. The control group consisted of 153 HCWs with no training. Participants for the intervention group were chosen from a list of previously trained HCWs. The control group subjects were chosen through convenience sampling, ie, based randomly on HCWs available for interviews. For optimum comparison basis, we attempted to match the control group to the intervention group, by securing a similar number of employees within the different professions and approximately the same number of health centers II, III, and IV/hospitals.

Intervention

This postintervention cross-sectional study analyzes the impact of the PHE training of HCWs in 2 phases during a 6-year period (2010-2016). Phase I trainings were conducted between 2010 and 2013 and Phase II in 2014-2016. The training consisted of a 2-day course and/or a refresher course lasting 2 to 3 hours. Participants were trained on knowledge of pesticides and management of APP. Trainings had been conducted in 42 health facilities in the Wakiso and 19 in the Pallisa districts. A total of 44 HCWs were trained during primary training in Pallisa (22 phase I and 22 phase II) and 56 in Wakiso (18 phase I and 38 phase II). In addition, a larger number of other HCWs who had missed the original training sessions were also trained during continuous medical education sessions at every health facility. The training was implemented by the PHE project and Uganda National Association of Community and Occupational Health (UNACOH) in collaboration with the Danish nongovernmental organization, Dialogos. The project is funded by The Danish Ministry of Foreign Affairs.

Study design and data collection

All participants were interviewed individually using a standardized semistructured questionnaire.

The questionnaire was based on a previous baseline questionnaire, with yes/no questions, multiple choice questions, and multiple answer questions. The questionnaires included such topics as knowledge of pesticides, symptoms and treatment of APP, and the medical practice at local health centers. Questions about knowledge were factual questions on pesticides designed to specifically test and evaluate the level of knowledge of the participants. The interviews were conducted by a research team consisting of a prime investigator, 3 medical students from the University of Southern Denmark, a local volunteer, and the local project coordinating district officer. The questionnaire is included in Appendix 1. A typical example of a knowledge question could be "How do you distinguish toxicity of pesticides?" The participants would then answer freely, and the answer recorded. For purpose of analysis, the answers were dichotomized into 2 variables: "correct" or "incorrect" answer.

The health centers were contacted a few days prior to the interviews, ensuring the availability of trained HCWs. Interviews were conducted in English and took on average 15 minutes for the intervention group and 5 minutes for the control group.

Due to the study being interview based, missing values were few and were mainly due to typing errors or mistakes in the interview process.

Data variables

The selected variables were questions most directly related to the measurable effect of the training. To make relevant comparisons, chosen questions were represented in the questionnaires for both control and intervention groups.

Work experience was divided into <5 and ≥5 years; the cutoff value was a good indicator to distinguish between participants with low and high experience in managing APP. Because cases of APP are relatively rare, we assume that HCWs with an experience ≥5 years are more likely to have encountered at least one case of APP.

Professions were split into 2 groups of somewhat similar education and responsibility: nurses (enrolled nurses, nursing assistants, and midwives) and doctors (medical doctors and clinical officers).

Health center IVs and hospitals were combined into one group due to similarities in management and resources. Only health center IIIs and IV/hospitals were included when stratified for health center as there were too few health center IIs to allow for statistically significant findings.

Sex (man/woman), profession (nurse/doctor), experience (months/years in profession), and health center level (III and IV/hospitals) were included by stratification in the final analyses.

Data analysis

The collected data were entered and analyzed in SPSS version 24. For bivariate analysis, data were categorized into dichotomous variables. Univariate descriptive statistics were

Table 1. Distribution of age, sex, profession, experience, and health center level of the interviewed health care workers (demographics).

	TOTAL	INTERVENTION	CONTROL	*P* VALUE
	NO. (%)	NO. (%)	NO. (%)	
Participants	326	173	153	
Age				
Mean	36.17 (20–60)[a]	36.16	36.18	
Gender				
Male	108 (33.1)	68 (39.3)	40 (26.1)	.012
Female	218 (66.9)	105 (60.7)	113 (73.9)	
Profession				
Nurses	243 (77.4)	124 (75.6)	119 (79.3)	.431
Doctors	71 (22.6)	40 (24.4)	31 (20.7)	
Experience, y				
<5	129 (39.6)	74 (42.8)	55 (35.9)	.208
>5	197 (60.4)	99 (57.2)	98 (64.1)	
Health centers				
II	27 (8.3)	12 (7.0)	15 (9.8)	.006
III	175 (53.8)	107 (62.2)	68 (44.4)	
IV	123 (37.8)	53 (30.8)	70 (45.8)	

[a]Range 20 to 60.

estimated for frequencies and percentages of all categorical or numerical variables. Relevant analyses were conducted using cross tabulation for dichotomous variables and Student *t* test for continuous variables. Frequency analyses were conducted for all relevant questions, to compare data between the intervention and control groups.

For questions with multiple correct answers, a cutoff for correctly answering the question was chosen. On routes of entry, 1 out of 4 possible correctly identified ways of entry was deemed a sufficient answer. Regarding the question of signs and symptoms of APP, ≥4 out of 19 correct symptoms were deemed as a sufficient answer. On the question of treatment, an acceptable score was as follows: for health center II, 1 out of 3 correct answers; for health III, >3 out of 7 answers; and for health center IV/hospital, >3 out of 8. Finally, all 7 knowledge questions were aggregated into 1 variable called total knowledge score. A good score was defined as ≥4 correctly answered knowledge questions.

Ethics

The study was approved by the Makerere University School of Public Health Institutional Review Board and by the Uganda National Council of Science and Technology.

The study was conducted according to the Helsinki declaration of ethical principles for medical research. All interviewees participated voluntarily and received information on the purpose of the study and confidentiality of personal information. Written and oral consent was obtained from each participant.

Results

Participants

The total number of participants was 326: 173 in the intervention group and 153 in the control group. The demographic details, distributed by age, sex, profession, years of experience in the field, and health center level, are provided in Table 1. The average age was 36 years in both groups. The study included more women than men, and there were significantly more women in the control group.

No difference was found in the distribution of professions and working experience between the 2 groups; meanwhile, the distribution of health center levels was significantly different.

Knowledge and practice

The level of knowledge among the HCWs is presented in Table 2. In all aspects of the knowledge section, there is a significant difference between the intervention group and the control group. The intervention group scored higher in the questions regarding the identification of pesticides and their toxicity. Concerning routes of entry both groups had a high

Table 2. Difference in knowledge on pesticides and poisonings among health care workers of the intervention and control group (χ^2 test).

	INTERVENTION	CONTROL	*P* VALUE
	NO. (%)	NO. (%)	
Do you know the chemical groups or classes of pesticides?			
Yes	68 (39.3)	20 (13.1)	<.001
No	105 (60.7)	133 (86.9)	
Do you know on what basis WHO categorizes pesticides?			
Yes	71 (41)	16 (10.5)	<.001
No	102 (59)	137 (89.5)	
Do you know how to distinguish the toxicity of pesticides?			
Yes	95 (54.9)	7 (4.6)	<.001
No	78 (45.1)	146 (95.4)	
Do you know which color is the most dangerous (red)?			
Yes	140 (80.9)	13 (8.5)	<.001
No	33 (19.1)	140 (91.5)	
Do you know which color is the least dangerous (green)?			
Yes	78 (45.1)	10 (6.5)	<.001
No	95 (54.9)	143 (93.5)	
Do you know in which way pesticides enter the body?			
Yes	162 (93.6)	132 (86.3)	.026
No	11 (6.4)	21 (13.7)	
Do you know the signs and symptoms of APP (more than 3)?			
Yes	112 (64.7)	79 (51.6)	.017
No	61 (35.3)	74 (48.4)	
Total knowledge			
Yes	116 (67.1)	12 (7.8)	<.001
No	57 (32.9)	141 (92.2)	

Abbreviations: APP, acute pesticide poisoning; WHO, World Health Organization.

percentage of participants with at least one correct route of entry. The intervention group showed significantly more awareness of signs and symptoms, but in both groups, the number of HCWs with a score of ≥4 was less than 65%. As for total knowledge score, 67.1% of the intervention group and only 7.8% of the control group had ≥4 correct answers.

Table 3 shows that in the intervention group, 44.9% of the HCWs from health center IIIs answered correctly, whereas the number in the corresponding control group was 23.5% ($P = .006$). No significant difference was found for HCWs working in health center IVs. Without stratification for health center level, the intervention group scored slightly higher, but the results were nonsignificant.

To control for possible confounders, data were stratified into sex, profession, work experience, and health center level to see whether there was a difference in total knowledge and treatment between the intervention and control groups in these subgroups (Tables 4 and 5). Stratification for age was not conducted as the age distribution was nearly the same in both groups. In total knowledge, every subgroup in the intervention group had significantly more correct answers. Overall, men scored higher than women (72.1% vs 63.8%), doctors had higher scores than nurses (87.5% vs 60.5%), and those with experience <5 years scored higher than those with ≥5 years of experience (71.6% vs 63.6%). The knowledge level in health centers III and IV was quite similar.

Regarding treatment (Table 5), the only significant differences between intervention and control groups were for female participants and for those in health center IIIs. Men scored higher than women within the control group, but there was no

Table 3. Difference in management of pesticide poisonings by health care workers of the interventiown and control group (χ^2 test).

QUESTION	INTERVENTION NO. (%)	CONTROL NO. (%)	*P* VALUE
Do you know how to treat patients with acute pesticide poisoning?			
Health center III			
Yes	48 (44.9)	16 (23.5)	.004
No	59 (55.1)	52 (76.5)	
Health center IV			
Yes	32 (60.4)	48 (65.6)	.345
No	21 (39.6)	22 (31.4)	
Do you know how to treat patients with acute pesticide poisoning?			
All participants			
Yes	85 (49.4)	65 (42.5)	.211
No	87 (50.6)	88 (57.5)	

Table 4. Difference in knowledge among health care workers of the intervention and control group, stratified by sex, profession, experience, and health center (χ^2 test).

		INTERVENTION NO. (%)	CONTROL NO. (%)	*P* VALUE
Gender				
Male	Yes	49 (72.1)	4 (10.0)	<.001
	No	19 (27.9)	36 (90.0)	
Female	Yes	67 (63.8)	8 (7.1)	<.001
	No	38 (36.2)	105 (92.9)	
Profession				
Nurses	Yes	75 (60.5)	8 (6.7)	<.001
	No	49 (39.5)	111 (93.3)	
Doctors	Yes	35 (87.5)	4 (12.9)	<.001
	No	5 (12.5)	27 (87.1)	
Experience, y				
<5	Yes	53 (71.6)	5 (9.1)	<.001
	No	21 (28.4)	50 (90.9)	
>5	Yes	63 (63.6)	7 (7.1)	<.001
	No	36 (36.4)	91 (92.9)	
Health center				
HC3	Yes	71 (66.4)	4 (5.9)	<.001
	No	36 (33.6)	64 (94.1)	
HC4	Yes	36 (67.9)	5 (7.1)	<.001
	No	17 (32.1)	65 (92.9)	

Table 5. Difference in management among health care workers of the intervention and control group, stratified by sex, profession, experience, and health center (χ^2 test).

		INTERVENTION NO. (%)	CONTROL NO. (%)	*P* VALUE
Gender				
Male	Yes	33 (49.3)	25 (62.5)	.183
	No	34 (50.7)	15 (37.5)	
Female	Yes	52 (49.5)	40 (35.4)	.035
	No	53 (50.5)	73 (64.76)	
Profession				
Nurses	Yes	56 (45.2)	42 (35.3)	.117
	No	68 (54.8)	77 (64.7)	
Doctors	Yes	26 (66.7)	20 (64.5)	.851
	No	13 (33.3)	11 (35.5)	
Experience, y				
<5	Yes	33 (45.2)	26 (47.3)	.816
	No	40 (54.8)	29 (52.7)	
>5	Yes	52 (52.5)	39 (39.8)	.073
	No	47 (47.5)	59 (60.2)	
Health center				
HC3	Yes	48 (44.9)	16 (23.5)	.004
	No	59 (55.1)	52 (76.5)	
HC4	Yes	32 (60.4)	48 (68.6)	.345
	No	21 (39.6)	22 (31.4)	

difference in the intervention group. Treatment scores within profession and experience were similar between the 2 groups. Health center IV scored higher than health center III, but no significance was found within intervention and control groups for health center IV.

Discussion

When comparing the intervention and control groups, our study showed significant differences in numbers of female and male participants. Generally, there were more women than men and more nurses than doctors. Most enrolled nurses, nursing assistants, and midwives were women and most clinical officers and medical doctors were men.[9] This is not surprising as men have easier access to higher education than women in Uganda.[10]

Health care workers in the control group were more experienced, perhaps due to overrepresentation of HCWs working at health center IV/hospitals in the control group. We stipulate that this might be due to health center IV/hospitals requiring experienced HCWs, as they deal with a larger number of patients with more severe conditions.

The intervention group had significantly more correct answers in all knowledge questions. About 93.6% of the intervention group and 86.3% of the control group could name at least one route of pesticide entry into the body. This is similar to the findings in a study from Bolivia showing that 94% of untrained HCWs could name at least one route of exposure.[11] In part, an explanation for the high number of correct answers in routes of entry is the definition of the aggregated variable, where mentioning one route of exposure resulted in a positive score. This is a low cutoff especially considering that many of the possible answers were nonspecific to APP. The same can be said for signs and symptoms, with 51.6% of controls giving correct answers. Many common diseases clinically present the same way as APP,[12] making it complicated to diagnose APP. The difference between the 2 groups was significant, but even so, only 64.7% of respondents in the intervention group could identify symptoms of APP, emphasizing the need for further training and refreshers on diagnosing APP.

A follow-up study in Nepal showed that the HCWs' ability to identify symptoms after their training was as high as 77.8%, whereas our study only showed a difference of 13.1% between trained and untrained HCWs.[13] We suspect that this is because there was no time gap between training and assessment in the Nepali study, whereas the gap was up to 6 years for several of the trained participants in our study. A plausible explanation is also that there was more room for improvement in Nepal than in Uganda because their baseline knowledge was lower.

As shown in Table 3, HCWs in the intervention group from health center IIIs were significantly better at treating APP according to their health center level. However, when looking at correct answers regardless of health center, no significant difference was seen between intervention and control groups. Overall, the difference after training in the ability to treat APP was not as great as the difference on knowledge of pesticides. This might be due to treatment of APP not differing greatly from treatment of other poisonings, whereas the knowledge questions were more specific.

As expected, the participants in the intervention group generally scored higher than the control group, especially regarding knowledge, indicating that trainings were effective and helped improve the knowledge of pesticides. Concerning treatment, the difference was not as clear, partly because the answers included many general treatment methods unspecific for APP.

Men in both groups answered more of the knowledge questions correctly, presumably because male participants have higher educational levels and thereby more knowledge and a greater responsibility at the health facilities. As for experience, the results showed that participants with <5 years of work experience scored higher than those with ≥5 years on the knowledge questions. We assume this difference is because most of the participants with experience <5 years were trained during phase II and thus had more recent knowledge. Although it was not significant, the more experienced participants had higher scores when it came to treatment, perhaps because the ability to manage cases of APP improves with experience.

Doctors had scored higher than nurses in both knowledge and treatment, which is most likely caused by the difference in education and level of responsibility at the facilities. As for health centers, when regarding treatment, the only notable difference was between health centers III and IV/hospital. Health center IV/hospitals might have scored higher because they receive more cases of APP due to referrals from lower health centers.

Limitations

To the best of our knowledge, this study is the first published with sole focus on HCWs and the only one that includes hundreds of participants in the health care sector.

It is worth considering that a follow-up study is a much stronger design and gives a more accurate estimate of the outcome variable. Regrettably, baseline data were not available to us.

A few problems arose when drafting the control group. Our goal was to ensure a distribution of HCWs equal to the distribution in the intervention group. In this we partly succeeded, by sourcing the participants in the intervention group from a register of trained HCWs. This was a way of minimizing selection bias. Our primary focus was to ensure that the different professions were represented equally in both groups, and as our results show, there was no significant difference. As described earlier, participants were chosen through convenience sampling, leading to potential selection bias. Even though an effort was made to target health centers matching the ones in the intervention group, in the end, this was not entirely possible, as some health centers were not willing or available to participate.

Therefore, health center IV/hospitals are overrepresented in the control group. The overrepresentation leads to potential

bias, as our studies show that HCWs at health center IV/hospitals scored higher at treatment, than those at lower levels, skewing the data by favoring the control group. This serves to lend further strength to our results.

Not all the trained HCWs were available for interview due to several factors such as pregnancy, transfers, sickness, unwillingness to attend, and death. This resulted in a loss of potential data/information on trained participants, which might have led to a potential sampling bias, as the HCWs who were interviewed might not be representative of the trained HCWs. Unwillingness to attend could lead to an overestimate of the effect of the training, as the possibility exists that the unwilling participants were those who benefitted the least.

The span of the study leads to potential recall bias making us question whether factors such as lack of patient contact and forgotten knowledge may lead to an underestimate of the effect of the training.

The training was conducted by multiple instructors. To be certain that the training sessions were similar, both groups should not only be trained the same number of days but also receive the lessons from the same person or a group of people using the same protocols.

In hindsight, coaching the interviewers beforehand would have been beneficial to ensure homogeneity in the interview process, minimizing interviewer bias.

Conclusions

Health care workers generally lacked knowledge of pesticides, in accordance with studies concluding that health care professionals in third world countries lack knowledge of APP. Corroborating the results of other studies, our study shows that training of HCWs results in improved knowledge and management of APP.

There is an urgent need to train HCWs due to a general deficit of knowledge on handling and managing APP. Many studies focus on prevention of APP and education of farmworkers, but as HCWs are a crucial factor in treating and preventing APP, it is necessary to focus attention and resources on both groups. We recommend continuous training of HCWs and further suggest including the topic of APP in national curriculums of health sciences at universities and nursing schools to improve awareness and knowledge of pesticides.

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Author Contributions

CS, KKJ, and BT all contributed equally to the study design; data collection data analysis; and writing of the article. VN contributed to the conception and design and data collection. EJ contributed to the conception and design and final revision of the manuscript for intellectual content.

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Appendix 1

HCWs' questionnaire—interviewer administered

1.0 IDENTIFICATION		
1.1	Respondent ID Number	
1.2	Interviewee name	
1.3	Interviewer Name	
1.4	Date of Interview	
1.5	District	
1.6	Sub-County/Town council	
1.7	Health center	
1.8	Telephone contact	
2.0 DEMOGRAPHICS		
2.1	Gender of respondent	
	1 = Male 2 = Female	
2.2	**Age**	
2.3	Highest level of education attained	
	1 = Secondary O'level 2 = Secondary A 'level 3 = Certificate 4 = Diploma 5 = University 6 = Other Tertiary institution (specify)_____	
2.4	Cadre of profession	
	1 = Nursing Assistant 2 = Enrolled Nurse 3 = Clinical Officer 4 = Medical doctor 5 = Midwife 6 = Other *(Specify)*_____	
2.5	How long have you been working in this profession/been in practice?	
	1 = Less than 1 year 2 = 1 – 2 years 3 = 2 years -5 years 4 = More than 5 years	
2.6	How long have you been working at this health facility?	
	1 = Less than 1 year 2 = 1 – 2 years 3 = more than 2 years -5 years 4 = More than 5 years	
3.0	**KNOWLEDGE**	
3.1	Do you know the chemical groups or classes of pesticides? 1 = Yes 2 = No	

Appendix 1. (Continued)

3.2	If yes; mention a few that you know of. 1 = Organophosphates 2 = Organochlorines 3 = Pyrethroids 4 = Carbamate 5 = more than 1 mentioned 6 = Others…….. (Specify)	
3.3	On what basis does World Health Organization (WHO) categorize pesticides?	
	1 = According to their toxicity 2 = Their chemical active ingredient 3 = The target organism 4 = Other (Specify)_____ 5 = Do not know	
3.4	How do you distinguish toxicity of pesticides?	
	1 = Based on signs and symptoms of pesticide poisoning 2 = Based on the smell of the pesticide 3 = Using labels on pesticide containers 4 = Using color codes 5 = Do not know	
3.5	Do you know what the different color codes mean?	
	1 = Yes 2 = No	
3.6	If yes, which of the color codes represents most toxic pesticide?	
	1 = Red 2 = Yellow 3 = Blue 4 = Green 5 = Don't know	
3.7	Which of the color codes represents least toxic pesticide? 1 = Red 2 = Yellow 3 = Blue 4 = Green 5 = Don't know	
3.8	Mention the way pesticides enter the body?	
	1 = Dermal (Skin) 2 = Inhalation 3 = Ingestion 4 = Eyes 5 = More than one 6 = Don't Know	
3.9	What are the signs and symptoms of acute pesticide poisoning? (Do not mention options, just tick as they come up with signs/symptoms. Indicate as many as possible.	
	1 = Nausea 2 = Blurred vision 3 = Dizziness 4 = Salivation 5 = Skin irritation 6 = Muscular weakness 7 = Headache 8 = Trembling hands 9 = Respiratory difficulties 10 = Extreme tiredness 11 = Vomiting 12 = Abdominal pain 13 = Loss of appetite 14 = Lack of coordination 15 = Excessive sweating 16 = Speech difficulty 17 = Dry mouth 18 = Loss of consciousness 19 = Swollen tongue ____	
	1 = 3 or less 2 = 4-9 3 = 10 or more 4 = None	

(Continued)

Appendix 1. (Continued)

4.0	**PRACTICES**		
4.1	What guide lines have been used at the facility when/if treating a case of pesticide poisoning? 1 = Uganda Clinical Guidelines 2 = PHE/UNACOH Healthcare workers/guidelines booklet 3 = None 4 = Don't know 5 = Both Uganda Clinical Guide lines & PHE/UNACOH booklet/guide		
4.2	If a case reported to you with a label or pesticide bottle, can you understand and interpret the health information on it? 1 = yes 2 = no		
4.3	If no; why can't you interpret it? 1 = limited knowledge 2 = have no experience with such cases 3 = never been trained to do so 4 = other (Specify)……..		
4.4	If Yes, from the label, which knowledge/information on health do you get? 1 = On toxicity 2 = On First aid 3 = On treatment 4 = Don't know 5 = More than one		
4.5	Do you treat people with acute pesticide poisoning at this facility? 1 = yes 2 = No		
	In which ways do you handle a case of acute pesticide poisoning at this facility?		
4.6	**HCII**	**HCIII**	**HCIV**
	1. Induce vomiting if ingested 2. Wash with soap & water for skin contact 3. Give charcoal tablets	1. Administer Intravenous fluids 2. Give charcoal tablets 3. Give atropine 4. Ant histamines 5. Steroids 6. Induce vomiting if ingested 7. Wash with soap & water for skin contact	1. Administer intravenous fluids 2. Gastric lavage with activated charcoal 3. Give charcoal tablets 4. Give atropine 5. Induce vomiting if ingested 6. Wash with soap & water for skin contact 7. Ant histamines 8. Steroids
	1 = one mentioned 2 = two mentioned 3 = All 4 = None	1 = 1-2 mentioned 2 = 3-4 mentioned 3 = more than 4 mentioned 4 = None	1 = 1-2 mentioned 2 = 3-4 mentioned 3 = more than 4 mentioned 4 = None
4.7	What do you consider before choosing treatment? 1 = Signs and symptoms 2 = Toxicity of the pesticide 3 = Patient history 4 = More than one of the above 5 = Available means 6 = Don't know		
4.8	Do you manage (diagnose and treat) different types of poisoning differently?		
	1 = Yes 2 = No		
4.9	Is there a difference in the way you medically treat pesticide poisoning due to different types/classes of pesticides e.g. organophosphates and Carbamates?		
	1 = Yes 2 = No 3 = Don't know		

Appendix 1. (Continued)

5.0	**PHE/UNACOH Training Impact Assessment**	
5.1	Have you attended the PHE/UNACOH primary training? 1 = Yes 2 = No	
5.2	How many PHE/UNACOH refresher training sessions on pesticide poisoning have you attended? 1 = Once 2 = more than once 3 = None	
5.3	Which Phase of PHE/UNACOH Project where you involved in? 1 = Phase I (2010 – 2013) 2 = Phase II (2014-2016) 3 = Both Phases 4 = None 5 = Don't know	
5.4	Have you been trained by co-workers who have had PHE trainings? 1 = yes 2 = no	
5.5	Apart from PHE/UNACOH trainings, have you ever been trained on pesticide poisoning? 1 = Yes 2 = No	
5.6	If yes; Who conducted the training? 1 = NGO (non Government Organization) 2 = Government (Ministry of Health) 3 = Trained from Medical School (Certificate/Diploma/Bachelors) 5 = Don't Remember 6 = Other……	
5.7	If yes; When was this training? 1 = less than 6 months back 2 = Between 6 and a 1 year 3 = more than a year back<5 years 4 = more than 5 years back 5 = Don't Remember	
5.8	Is there a difference in the way you diagnose, manage and treat pesticide poisoning ever since you were trained by PHE/UNACOH? 1 = yes 2 = No 3 = Don't know	
5.9	If yes; Mention any differences/changes in the way you handle cases since the training by PHE/UNACOH. 1 = I Now consider the chemical groups of the pesticide that caused the poisoning before treating 2 = consider the toxicity of the pesticide if bottle/container is availed 3 = consider the severity of the symptoms 4 = more than one mentioned 5 = Now treating cases 6 = others	
5.10	How do you report pesticide poisoning? 1 = Using the PHE/UNACOH developed forms 2 = Using the HMIS tools (District forms) 3 = Through phone calls to PHE/UNACOH officer 4 = Don't know 5 = More than I mentioned 6 = Other……	
5.11	Have you taken initiative to practice what you learnt or introduced any new ideas at the facility as far as prevention of pesticide poisoning is concerned? 1 = Yes 2 = No	

(Continued)

Appendix 1. (Continued)

5.12	If yes; mention what you have done 1 = Giving information to patients and/or care givers 2 = Doing paperwork and/or routine data inputting on pesticide poisoning 3 = Sharing pesticide information with colleagues 4 = Using the given IEC (information, education & Communication) materials (Health booklet and posters) 5 = more than 1 of the above 6 = Other (specify)……	
5.13	How was the practice when referring cases before the training? 1 = all received cases were referred regardless 2 = cases were given first aid before referral 3 = only severely poisoned cases were referred 4 = can't recall 5 = None are referred	
5.14	How is the practice now when referring cases since you got the training? 1 = all received cases are referred 2 = cases are given first aid before referral 3 = only severely poisoned cases are referred 4 = can't recall 5 = none are referred	
5.15	Have you trained any of your colleagues in pesticide poisoning? 1 = Yes 2 = No	
5.16	If yes, what exactly did you train them on? 1 = Diagnosis, management and treatment 2 = Effects of pesticide poisoning 3 = Prevention 4 = Reporting 5 = More than one 6 = Others……..	
5.17	Do you ever use the IEC materials given to you? 1 = yes 2 = No	
5.18	If yes, how have the IEC materials been of importance to you and the facility? 1 = Guide during management and treatment 2 = Guide on Reporting cases 3 = Guide on teaching others 4 = More than one 5 = Other ……..(Specify)	
5.19	On average; how many cases were you receiving before the PHE/UNACOH training? 1 = None in a month 2 = 1 in a month 3 = 2-5 in a month 4 = more than 5 cases in a month 5 = Don't know	
5.20	On average; how many cases are you receiving after the PHE/UNACOH training? 1 = None in a month 2 = 1 in a month 3 = 2-5 in a month 4 = more than 5 cases in a month 5 = Don't know	
5.21	Is there any difference in the number of deaths before and after the training? 1 = yes 2 = No	
5.22	If Yes; are the deaths less or more? 1 = less 2 = More 3 = No difference	