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Prevalence and determinants of pesticide use in informal households in Mulago II parish, Kampala Uganda

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The indiscriminate use of pesticides in developing countries has impacted negatively on the environment and public health. Despite that informal households in Uganda carry a high pest burden, the safe use and disposal of pesticides is poorly studied. We determined the prevalence and pesticide use practices among the informal households in Mulago, a suburb of Kampala city. A cross-sectional survey was conducted among heads of informal households in Mulago II parish, using a semi-structured interview questionnaire. Out of the 56 households in the parish, twenty 20 household met the inclusion criterion for an informal household. Household heads were interviewed on the pest burden and the practices on safe use and disposal of pesticides. Data was analyzed using SPSSv21 software; the chi-square test was used for Univariate analysis. The mean pest burden per household was 4 ± 0.7 pests: mosquitoes 20 (100%), bedbugs 18 (90%; p < 0.001), rats and houseflies 16 (80%; p = 0.007), and cockroaches 15 (75%; p = 0.025). Most households, 17 (85%, p = 0.002) had used a pesticide within the last 2 weeks. The most commonly used pesticides were synthetic pyrethroid in form of aerosols 18 (90%) or insecticide coils 10 (50%) and organophosphate solutions 15 (75%). Pesticides were applied on walls 15 (75%; p < 0.001) and in open air 12 (60%; p = 0.086). Pesticides were stored in lockable cupboards in 6 (30%; p = 0.645) households. The use of pesticides was associated with having livestock, cost of pesticide and the burden of pest infestation. Informal households in Mulago parish have a high pest burden and usage of pesticides. The use, storage and disposal of pesticides are largely inappropriate. Public health interventions that promote the access to quality and safe use of pesticides at informal households are critical.

Keywords: Prevalence, Pesticide Use, determinants of pesticide, Uganda.

INTRODUCTION

Globally, the extensive use of pesticides has negatively impacted on the environment (Adeola, 2012; Ecobichon, 2001; Williamson, 2003) public health (Bass et al., 2001; Coronado et al., 2004; Zahm et al., 1977) and agricultural productivity (Bouwman and Kylin, 2009; Grey et al., 2005, Konradsen, 2003; Tadesse, Republic of Uganda, 2007). Uganda, a predominantly agricultural country, imports over 2,224 tons of pesticides annually with over 300

pesticide formulations on open market (Makerere, 2006; Nalwanga and Ssempebwa, 2011). By the year 2007 only forty four pesticide products were registered for use in Uganda (Karungi et al., 2011; Kegley et al., 2007). In Uganda, households are main consumers of the pesticides that are used either to control vectors of human animal or for crop diseases (Bonabana-Wabbi and Taylor, 2002; Makerere, 2006; Republic of Uganda, 2007; Schaefers, 1999). Despite the legislation on the safe use and disposal of pesticides in Uganda, systems to foster rational practices are poorly implemented (Bonabana-Wabbi and Taylor, 2002; Karungi et al., 2011; Konradsen et al., 2003). The use of pesticides in Uganda is characterized by irrational distribution practices such as repackaging and adulteration for sale to unsuspecting illiterate and poor people (FAO/WHO, 2001; Karungi et al*.,* 2011). The lack of protective gear and knowledge on safety measures when using the pesticides at households in Uganda is also common (Karungi et al., 2011; Nalwanga and Ssempebwa, 2011). The exposure of household members to pesticides via the oral, dermal, inhalation routes in households impacts on the health of the family (FAO/WHO, 2001; WHO, 1997). Studies have shown that children are a greater risk of exposure and adverse effects of pesticides (Bass et al*.,* 2001; Goldman, 1995; Reigart, 1995; USEPA, 1998). Recently, there is an upward trend of childhood neoplasms that have been associated with pesticide residues in agricultural produce and environment (Bonabana-Wabbi and Taylor, 2002; WHO, 1997; Zahm et al*.,* 1977). Previous pesticide use studies in Uganda have focused at household in rural settings that are predominantly agricultural and or formal householdsBonabana-Wabbi and Taylor, 2002; Karungi et al., 2011; Makerere, 2006). The studies have associated the indiscriminate use of pesticides to the lack of adequate and objective information on pesticide proper use (Bonabana-Wabbi and Taylor, 2002; Nalwanga and Ssempebwa, 2011). Despite the detrimental effects of pesticides, very little is known on the non-occupational use and disposal of pesticides in informal households in Uganda.

MATERIALS AND METHODS

Respondents

We interviewed the heads of 20 informal households in Mulago II parish, a suburb of Kawempe division located about five kilometres outside Kampala city, Uganda. An informal household in this study was defined as a makeshift house and or one without an approved plan from the local council. The informal households in the parish have poor utility services such as water, household refuse and sewage disposal systems. Household refuse is dumped at undesignated areas. Household were selected from the local council register for Mulago parish II. The sampling frame was 56 households; twenty two of these met the inclusion criteria for an informal household and having at least a child in the family. Two were excluded from the study due to lack of access to an adult respondent (> 18 years). We also interviewed a community health worker (CHW) and an attendant in a veterinary shop within the parish.

Methods

A cross sectional survey design was used to collect data using a semi-structured interview questionnaire over a one month period starting from July 26 to August 26, 2011. The questionnaire used in this survey was pretested on two households in the same parish. The researcher administered one-on-one interviews with the house heads after obtaining informed consent. The main outcome variables were the pest burden per households and the use and storage practices of pesticides. For this study, the term “household pesticide” was defined for the respondents as “any product used in or around the home for cockroaches, insects, termites, rats and other rodents, fleas and ticks, weeds in the garden, and to keep animals away from the garden or compound”. Observations on the name and formulation of pesticide used and the storage were made using a checklist. Data were entered into SPSSv21 software for quantitative analysis using chi-square test. Qualitative data obtained from the respondents and the CHW and veterinary shop attendant were thematically analyzed.

Ethical consideration

The study was approved as part of the field studies by the School of public health, Makerere University. The participation of respondents was entirely voluntary following provision of informed consent. All questionnaires were assigned unique identifiers and details such as names of the respondents were not obtained.

RESULTS

Demographic characteristics of respondents and households

According to Table 1, the respondents had a median age of 28.5 ± 6.24 years with majority in the age category of 20 to 30 years 14 (70%; p = 0.002). All the 20 households had at least one child. The median number of children per household was 3.0 ± 1.76. There was no significant difference in the sex and education level of the respondents as well as the number of children per household (p > 0.05). All the households kept at least one animal: with chicken 12 (60%) and dogs 4 (20%) the

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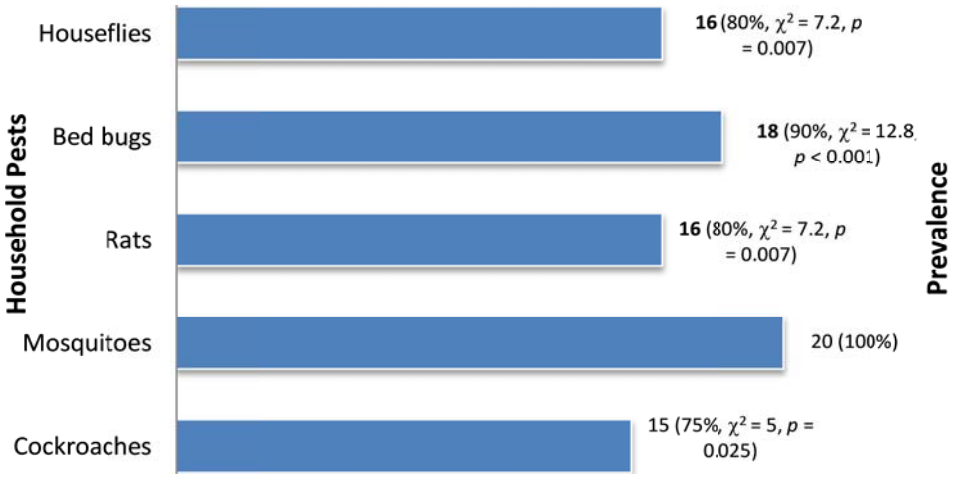

Figure 1. The pest burden at the households.

most common (p = 0.004). One third 6 (30%; p = 0.074) share their households with chicken particularly at night. The median number of pests per household was 4 ± 0.7:with mosquitoes (100%), bedbugs 18 (90%; p < 0.001), rats and houseflies 16 (80%; p = 0.007) the most prevalent (Figure 1).

Pesticide use, storage and disposal practices at household in Mulago II parish

Majority of the households use pesticides 17 (85%; p = 0.002). Pesticides were applied by a member of the household (85%). Most pesticides were mainly applied on walls 15(75%; p = 0.000) and or in open air 12 (60%; p = 0.085) of the house. Pyrethrum pesticides (doom®) used were the most commonly used solid forms as powders (50%), coils (60%) or insecticide chalk (50%). Organophosphate pesticides (Diazinon®) (75%) were the most commonly used liquid form as sprays. Majority of the respondents adhered to the label instructions on the package leaflets 13 (65%; p = 0.011); 70% perceived the pesticides to be effective and used pesticides at least once every month. Various formulations of pesticides were used: the chalk, powder and coils being the most common. Pesticides were stored appropriately in lockable cupboards (30%; p = 0.645): or in bedrooms, tins, under carpets. Some households 5 (25%) did not have a specific storage place for the pesticides. Majority of the households reported taking precautionary measures such as washing hands and keeping children away (100%), opening windows (90%), while using the pesticides (Figure 3). Most households obtained information on the use of the pesticide from sales points (75%) and through advertisements (65%) (Figure 2).

DISCUSSION

Majority of the respondents in this study were aged between 20 and 30 years; half of them had attained at least secondary education and had 3 to 5 children per household. We found no association between the demographic characteristics and the use of pesticides. A similar study in Nigeria also found no association between the family size and pesticide use (Sosan and Akingbohunbe, 2009). All households kept domestic animals in form of poultry, pets and livestock. About one third (30%) of these households shared their house with chicken at night. There is a high pest burden at the informal households in Mulago II parish with a mean number of pests averaging to four pests per household; mosquitoes and bedbugs the most prevalent. Similar studies in Uganda by Nalwanga et al., (2011) reported a high burden of mosquitoes (83%), cockroaches (69%) and rats (52%) (PIP Uganda, 2002; Nalwanga et al., 2011). Studies done among farming communities in rural Uganda also reported the use of out-door pesticides against mosquitoes and cockroaches at households (Bonabana-Wabbi and Taylor, 2002; Karungi et al., 2011). Unlike the previous studies done in Uganda, this study found a higher prevalence of bedbugs at the households. The type of household may be a major determinant of the level and type of pest burden. Informal households may have a greater risk for infestation to pests. Similarly the community health worker attributed a rising malaria burden in the area to the poor water drainage systems and clogged trenches. The practice of humans living in close proximity to animals is a significant contributor to pests within urban areas since they harbour pests like fleas and lice. The CHW also stated that: “the high burden of bedbugs is difficult to eradicate since they

Table 1. Demographic characteristics of the households and respondents.

Characteristic	Frequency (%)	df	χ^2	P - value
Sex of respondent				
Male	10 (50)	1	0.000	0.861
Female	10 (50)			
Age (Years)				
20 - 30 years	14 (70)			
31 - 40 years	4 (20)	2	12.4	0.002
41 - 45 years	2 (10)			
Highest education level				
Primary	6 (30)			
Secondary	10 (50)	2	2.8	0.247
Tertiary	4 (20)			
Number of children				
1 - 2 children	6 (10)			
3 - 5 children	10 (50)	2	2.8	0.247
> 5 children	4 (20)			
Animals kept				
Chicken	12 (60)			
Dogs	4 (20)	3	13.6	0.004
Goats	2 (10)			
Other (Cows**)**	2 (10)			
Share household with animals				
Yes	6 (30)	1	3.2	0.074
No	14 (70)			
Number of pests/household				
3 pests	3 (15)			
4 pests	9 (45)	2	3.1	0.212
5 pests	8 (40)			

at times require replacement of old items like mattresses with new ones". The CHW also lamented that "some of the pests require massive pesticide application by many households if they are to be controlled". We also found out that the prevalence of pesticide use at the informal households was high (85%) (Table 2). The most commonly used pesticides were synthetic pyrethroid inform of aerosols or insecticide coils and organophosphate solutions. A study in Minnesota also found a usage of pesticides to be at 88% among the household with children with the mean pesticides used per households being 3.1 products per house hold (Adgate et al*.,* 2000). A similar study done in Uganda households also reported the use of pesticides as the most preferred method for pest control. Usage was found to be at 98% with insecticide spray being the most common form of application (71.4%) (Makerere, 2006). Similar studies by Wu et al. (2011) and Nalwanga et al., (2011) reported the use of pesticide sprays, coil and insecticides chalk for pest control in their house. A study in Thailand also reported a high use of pesticide (73.1%) in their households, pesticides that contain pyrethroid ingredient (Saowanee et al*.,* 2002; Tadesse and Asferachew, 2008). Similar studies by Bass et al., (2012) and Sosan and Akingbohungbe (2009) also showed that households used a wide range of pesticides for pest

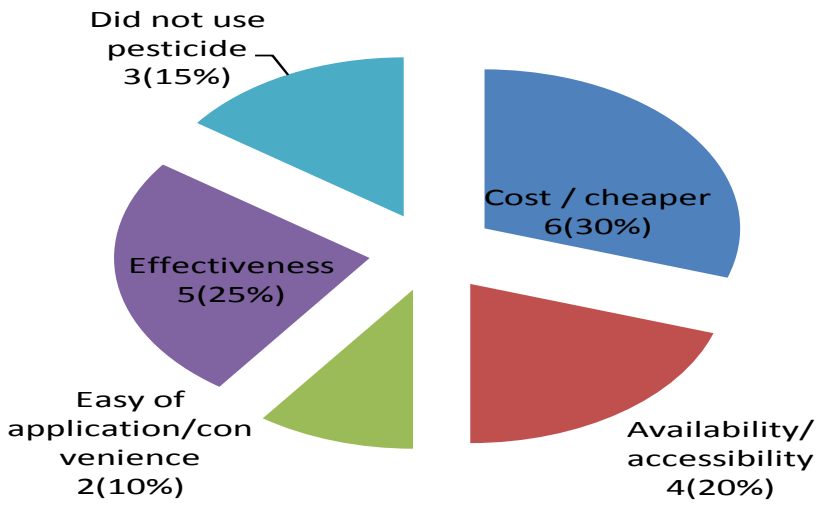

Figure 2. Sources of information on pesticides used at the household level.

Table 2. Prevalence of pests and pesticide use at households in Mulago parish.

Characteristic	Frequency (%)	df	χ^2	P - value
Used pesticides in the past 2 weeks				
Yes	17 (85)	1	9.8	0.002
No	3 (15)			
Who administered the pesticide				
Family member	17 (85)	1	9.8	0.002
Did not use pesticide	3 (15)			
Time pesticides were applied				
At night	9 (45)			
During day time	8 (40)	2	3.1	0.212
Did not apply	3 (15)			
Method used to apply the pesticide				
Directly on house walls	15 (75)	2	15.7	0.000
Directly on the pest	5 (25)	2	6.7	0.035
Open air in the house	12 (60)	2	4.9	0.086
Under carpets or as traps	5 (25)	2	6.7	0.035
Adhered to label instructions				
Yes	13 (65)			
No	4 (20)	2	9.1	0.011
Do not use pesticides	3 (15)			
Formulation of pesticide used				
Powder	10 (50)	1	0.000	1
Spray	5 (25)	1	5	0.025
Insecticide chalk	10 (50)	1	0.000	1
Coils	12 (60)	1	0.800	0.371

Table 2. Cont'd.

Were the pesticides effective				
Yes	14 (70)	1	3.2	0.074
No	6 (30)			
Frequency of application				
Daily	3 (15)			
2 - 3 times a week	5 (25)	3	7.6	0.055
Once a week	10 (50)			
Every month	2 (10)			
Where are pesticides stored				
Store/ locked cupboard	6 (30)			
Bedroom	2 (10)			
Anywhere/no specific place	5 (25)	4	2.5	0.645
Others: Tins, Under carpets	4 (20)			
Do not use pesticide	3 (15)			

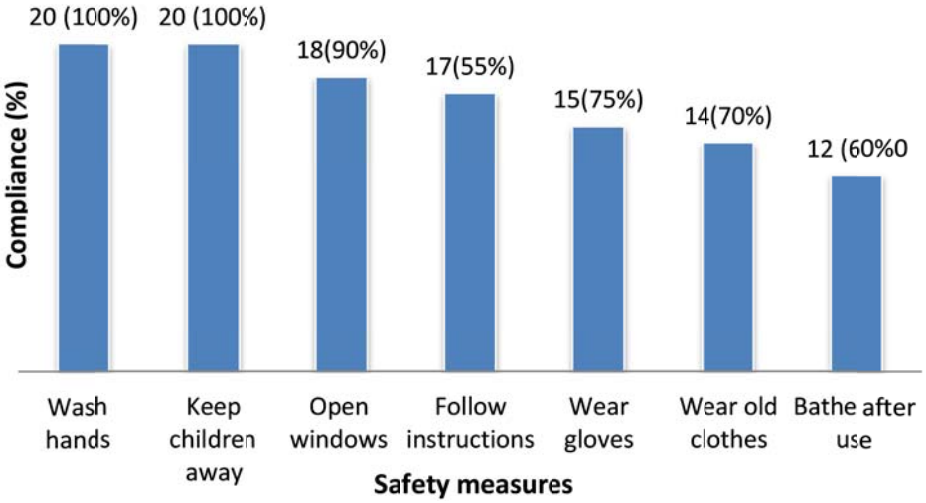

Figure 3. Safety measures taken when using pesticides at the informal households.

control (Bass et al., 2001; Sosan and Akingbohungbe, 2009). The overuse of organophosphate pesticides has been reported to be common in farming communities (Saowanee et al*.,* 2002). The choice of the pesticide to use was largely influenced by cost (50%) the prior effectiveness of the pesticide (70%). In this study we found that only one third of the households stored pesticides appropriately in lockable cupboards. Similar studies have reported inappropriate storage of pesticides in places such as bedrooms and in kitchens (Graham et al*.,* 2005; Hong and Yonglong, 2007; Nalwanga and Ssempebwa, 2011; Saowanee et al*.,* 2002). A study in the Unites States of America reported that Seventy percent (70%) of all the pesticides were stored inside the home, with the kitchen being the storage room most often mentioned (Bass et al., 2012). Most of the informal households in Mulago II parish adhered to safety precautions when using pesticides. This may be due to the high literacy level of respondents in this study who were able to read and understand instructions for use of the pesticides. However a study among vegetable farmers in Nigeria revealed that 85% of farmers did not

use protective gear when using pesticides (Adeola, 2012). Studies in Uganda, Thailand and Nigeria have associated the non-adherence to safety measures when administering pesticides at home to the lack of knowledge on safe use practices (Karungi et al*.,* 2011; Saowanee et al*.,* 2002; Sosan and Akingbohunbe, 2009; Schaefers et al*.,* 1999). However in this study we did not find association between the level of education and frequency of pesticide use to the safety precautions. Pyrethrins have been reported to be the most common cause of insecticide poisonings (Insecticide fact sheet, 2002). And Diazinon® the most commonly used organophosphate among the informal households was not registered for use in Uganda or its use is restricted by USEPA or restricted on the basis of environmental hazard (Schaefers et al*.,* 1999; Republic of Uganda, 2007).

CONCLUSION AND RECOMMENDATIONS

There is extensive and relatively inappropriate use and storage of pesticides, rendering the people in Mulago Parish II households and community exposure to the hazardous effects of the pesticides. The choice, frequency, storage and mode of application of the pesticides expose the household members to health hazards. The lack of public health systems at households for garbage collection, drainage of trenches predisposes households to pest infestation and over use of pesticides. There is a lack of reliable information on pesticide use, since majority of the people obtained information from the sales point, which were mainly general shops and from advertisements. There is need for the government to implement safe and efficacious pesticide services to low income households with high pest burden and strengthen pesticide use at outlets. Interventions particularly at points of sale would be a critical avenue for promoting safe use of pesticides in households. There is also need for massive sensitization on the dangers and use of pesticides.

Conflicts of interest

The authors have no conflict of interest to declare.

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