

*Full Length Research Paper*

# **Assessment of household knowledge, attitude and practices on disposal methods of expired and unused medicines among residents of Lusaka City, Zambia**

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**Medicines play an important role in treating different diseases and conditions, but when left unused or to expire at home and improperly disposed, they may cause environmental pollution and can be hazardous to health. In this study, assessment of household knowledge attitude and practices on disposal methods of expired and unused medicines among residents was done in selected areas of Lusaka City, Zambia. This was achieved through the use of a standardized questionnaire among 385 participants. The study revealed that 94.5% of participants never received information towards safe disposal methods of expired and unused household medicines. Our study also found that 97% of participants threw away the expired drugs while 95% kept unused medicines in their homes. Only 2% and 1% of participants returned expired and unused household medicines to pharmacies respectively. In this study, there was lack of household knowledge on safe disposal methods among the majority of participants and most disposal methods used by participants are not recommended. However, participants had positive attitude towards safe disposal methods and therefore, there is need to establish state run drug take-back program of collecting unused and expired household medicines.**

**Key words:** Disposal methods, knowledge, attitude, medicines, practices, unused, expired.

## **INTRODUCTION**

Improper disposal methods of expired and unused medicines are a global problem and occur in both developing and developed countries. In developing countries, this problem is enormous and not well documented (Atinafu et al., 2014; Hahladakis et al., 2018). Improper disposal of medicines is associated

with environmental pollution and is a health hazard (Ajah et al., 2015; Yang et al., 2018). Improper drug disposal can lead to contamination of drinking water, development of antibiotic resistance and exposure of people to irritant or mutagenic anticancer drugs (Al-Naggar and Alarefi, 2010; Kraemer et al., 2019). Factors such as poor

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adherence, discontinuation of medication, adverse effects and dose changes have led to accumulation of expired and unused medicines in some households (Lystlund et al., 2014; Makki et al., 2019). A study which was conducted in Ethiopia showed that 89.1% of medicines that are procured by consumers are never used (Atinafu et al., 2014). Therefore, this may suggest that many patients and families are in possession of unused or expired medicines (Bashaar et al., 2017; Ananth et al., 2010).

Different studies conducted in different parts of the world on disposal practices for unused medicines revealed that the most popular method for household drug disposal was by trashing into the garbage (24% to 89%) or rinsing down in the toilet or sink (2 to 55%) (Atinafu et al., 2014). In a study conducted in India, most consumers stated that they dispose their medicines in the garbage and sink (Swaroop et al., 2015). In a survey conducted in the United States, more than half of the patients reported storing unused and expired medications in their homes, and of those, more than half had flushed unused and expired medicines down the toilet (Seehusen and Edwards, 2006). In Qatar, an exploratory study on medications in households conducted by Kheir and colleagues (2011) found that the majority of their study population shared prescription medications and disposed unused medicines in the garbage (Kheir et al., 2011).

In Nairobi, Kenya, a study was done on Household Knowledge and Perceptions on Disposal Practices of Unused Medicines and found that households' knowledge on disposal practices was deficient due to lack of public outreach and awareness campaigns, negligence among healthcare professionals to provide disposal guidance at hospitals and pharmacies, unclear disposal instructions on medicine packages and negligence to read disposal instructions (Ang'ienda, 2017). Although international guidelines exist on proper disposal methods of expired and unused medicines (Abahussain and Ball, 2007), these guidelines are usually not properly enforced and very little information which is sometimes contradictory is available to the public (Peake et al., 2015; Abruquah et al., 2014).

Even though different studies have been conducted in different parts of the world to show the pattern of improper disposal of expired and unused medicines, it is not known how Lusaka residents dispose expired and unused medicine because there is currently no system that has been put in place by the regulatory authority on how to handle expired and unused medicines at household level

Furthermore there has not been any published study on assessment of household knowledge, attitude and practices on disposal methods of expired and unused medicines in Zambia. It is therefore, important to assess how expired and unused medicines are disposed of in Lusaka City.

## MATERIALS AND METHODS

### Study design and description of study settings

This is a cross-sectional study conducted among residents of selected areas in Lusaka City from 11<sup>th</sup> June to 11<sup>th</sup> July, 2018. The areas that were covered are low densely populated (Olympia, Woodlands) and high densely populated (Kanyama, Mtendere) which are inhabited by people from different cultural, educational and social backgrounds.

### Study design

This study was undertaken through a face to face interview using structured questionnaires adopted from Ayele and Mamu (2018) to assess the knowledge, attitude and practices towards disposal of unused and expired pharmaceuticals among selected households in Lusaka City, Zambia. The questionnaire was slightly modified after pretesting to suit our setting; it comprised three parts: part I included demographic details of the study participants such as gender, age, residential area and level of education. Part II comprised questions regarding the knowledge of unused and expired drugs. In Part III, the questions were related to altitude and practices of unused and expired drug disposal.

### Study population

The study population included residents of either sex (male or female) who comprised students, public and private sector employees, storekeepers and population from other walks of life regardless of ethnicity or employment status, above the age of 18 years, who were residents of Olympia, Woodlands, Kanyama and Mtendere in Lusaka, Zambia.

### Sample size determination and sampling technique

The sample size was calculated using the proportion formula:  $n = Z^2p(1-p)/e^2$  and confidence interval level was set at 95% = 1.96. The estimated population proportion was 50% since the total population for the study areas was unknown and margin of error was set at 5%  $n = (1.96)^2(0.5)(1 - 0.5) / (0.05)^2 = 384.16 = 385$  participants. According to Zambia Classified Urban Areas 2 (C.S.O), the approximate number of households in the following residential areas (Olympia, Woodlands, Kanyama and Mtendere) was 2240, 3614, 15084 and 11853 respectively. The approximate total number of households in all the residential areas was 32791. Therefore, the sample size was divided among the four residential areas by the use of probability-proportion to size. For Olympia,  $n = 2240 / 32791 \times 385 = 27$  participants. For Woodlands,  $n = 3614 / 32791 \times 385 = 43$  participants. For Kanyama,  $n = 15084 / 32791 \times 385 = 178$  participants. For Mtendere,  $n = 11853 / 32791 \times 385 = 140$  participants. We first randomly selected the four residential areas from the low (Olympia and woodlands) and high (Kanyama, and Mtendere) density townships around Lusaka city so that we have a sample that is well represented. We then used systemic sampling to select the households in these areas. Every fourteenth and ninth household was selected in Olympia and woodlands respectively. For Kanyama and Mtendere every second and third household was selected respectively. Only one participant from each household participated in the study.

### Data processing and analysis

All the questionnaires were double-checked for accuracy and

**Table 1.** Social-demographic profile of participants.

Variable	Characteristics	Frequency (N)	Percentage
Age	Median: 30 (Min – Max): 18-79		
Sex	Male	41	10.6
	Female	344	89.4
Highest level of education	Primary	99	25.7
	Secondary	217	56.4
	Tertiary	69	17.9
Residence	Kanyama	175	45.5
	Mtendere	140	36.4
	Woodlands	43	11.1
	Olympia	27	7.0

sorted out manually. The raw data were then entered in Microsoft Excel spreadsheet and exported to Stata version 13 for statistical analysis. Descriptive statistics on sample characteristics was computed including median, interquartile range, frequencies and percentages. These were presented using tables and figures.

#### Ethical considerations

The research proposal was submitted to the University of Zambia, School of Health Sciences Research Ethics Committee in order to obtain ethical approval (Ref: 20171226145). Written and verbal consent was obtained from potential participants by explaining the objectives and anticipated benefits of the study. Their participation was on a voluntary basis and their confidentiality was assured before filling the questionnaire. No risks in participating in the study were assured to potential participants.

## RESULTS

### Social-demographic profile of participants

A total of 385 households were visited and of these households, majority were from Kanyama 175 (45.5%), followed by Mtendere 140 (36.4%), Woodlands 43 (11.1%) and Olympia 27 (7.0%) respectively. Of the participants, 344 (89.4%) were females and 41 (10.6%) were males. The median age of the participants was 30 years (IQR = 18-79). In terms of education, 99 (25.7%) of the participants attained primary education, 217 (56.4%) secondary education with 69 (17.9%) attaining tertiary education as presented in Table 1.

### Participants' knowledge on disposal methods of expired and unused medicines

As shown in Table 2, about half of the participants 200 (51.9%) knew about medication waste. However, the

majority of participants 364 (94.5%) had never received any information about the safe and proper way to dispose medication waste. Interesting enough, a large portion of the participants 255 (66.2%) did not ever read medicines disposal instructions. Majority of the participants 212 (55.1%) responded that improper disposal of unused and expired medicines could affect the environment and health. In response on how to achieve community awareness on proper medicine waste disposal, 40.2% suggested that the media was the best source followed by doctors with 18.2% and Pharmacist with 13.0%.

### Participants' attitude on unused and expire household medicines

A total of 328 (85.2%) of the participants "strongly agreed" that children are more vulnerable to the risks associated with unused and expired household medicines. Further, 199 (51.7%) of the participants "strongly agreed" that there is no adequate information regarding the safe disposal of unused and expired household medicines hence, Pharmacists, doctors and other healthcare professionals should provide advice on safe medicine waste disposal. The majority of participants [259 (67.3%)] also "strongly agreed" that take-back programs of unused and expired medicines should be introduced in communities as indicated in Table 3.

### Disposal practices of unused and expired medicines among participants

100% of the participants agreed to have kept either unused or expired medicines in their homes before. When asked what they did with expired medicines,

**Table 2.** Participants knowledge of unused and expired household medicines disposal in Lusaka (n = 385).

Question/statement	No. (%)
<b>Do you know about medicine waste?</b>	
Yes	200 (51.9)
No	185 (48.1)
<b>Have you ever received any information about the safe and proper way to dispose expired and unused medicines?</b>	
Yes	21 (5.5)
No	364 (94.5)
<b>Do you ever read medicines disposal instructions?</b>	
Yes	130 (33.8)
No	255 (66.2)
<b>Can improper disposal of unused and expired medicines affect the environment and health?</b>	
Yes	212 (55.1)
No	173 (44.9)
<b>Who is the appropriate person to inform about proper disposal of unused or expired?</b>	
Doctors	70 (18.2)
Nurses	30 (7.8)
Pharmacist	50 (13.0)
Media	155 (40.2)
Others	80 (20.8)

Others: community health workers, churches, members of parliament.

**Table 3.** Participants' attitude on unused and expired household medicines among Households in Lusaka.

Statement	Strongly Agree [No. (%)]	Agree [No. (%)]	Neutral [No. (%)]	Strongly disagree [No. (%)]	Disagree [No. (%)]
Children are more vulnerable to the risks associated with unused and expired household medicines	328 (85.2)	54 (14.0)	3 (0.8)	0	0
There is no adequate information regarding the safe disposal of unused and expired household medicine	199 (51.7)	63 (16.4)	15 (3.9)	12 (3.1)	96 (24.9)
Pharmacist, Doctors and healthcare professionals must provide advice on safe disposal of unused and expired household medicines	295 (76.6)	45 (11.7)	5 (1.3)	10 (2.6)	30 (7.8)
Take-back programs of unused and expired medicines should be introduced in the communities	259 (67.3)	57 (14.8)	18 (4.7)	9 (2.3)	42 (10.9)

majority of them [375 (97%)] stated that they threw them away while 2.8% of them returned the medicines to pharmacies. On the other hand, 364 (95%) of the participants stated that they kept the unused medicines, while 1% of them returned them to pharmacies (Table 4). Majority of the participants [232 (60.3%)] disposed their medicines in household garbage and 117 (30.4%) flushed them in toilets. The most common classes of medicines kept in households were antibiotics (55.9%)

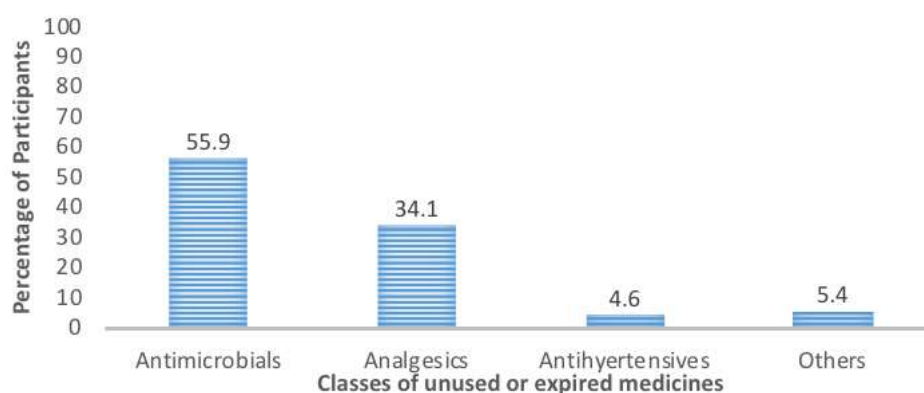
followed by analgesics (34.1%) (Figure 1). Reasons of having unused or expired medicines were mainly due to improved disease or symptoms (45.9%), followed by excess quantity supplied (29.9%) and experiencing of side effects (21.9%) (Figure 2).

## DISCUSSION

This study was aimed at assessing household knowledge

**Table 4.** Disposal practice of unused and expired pharmaceuticals among households in Lusaka n=385.

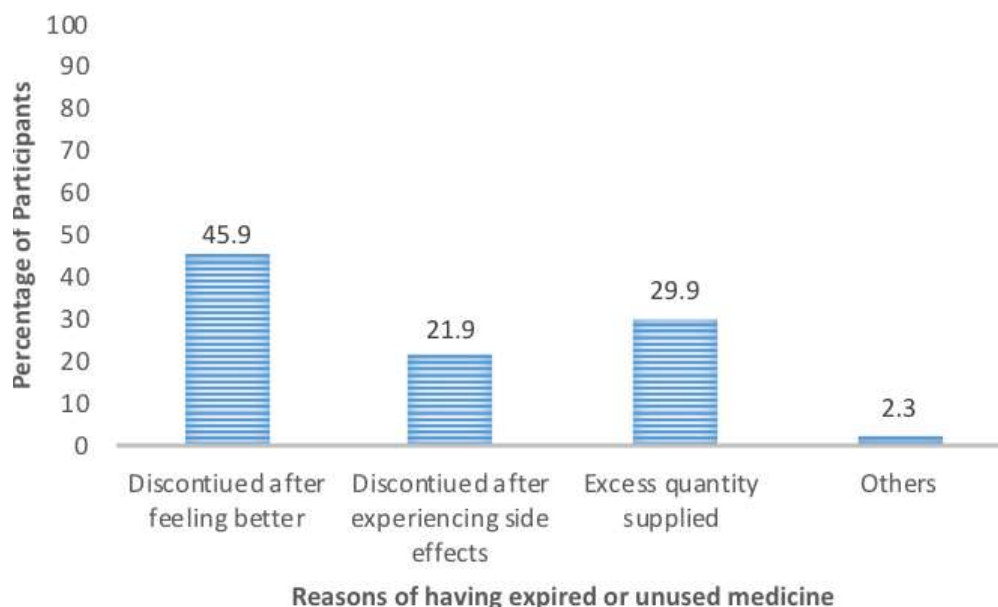
Question/Statement	No. (%)
<b>Have you ever kept unused or expired medicine in your home?</b>	
Yes	385 (100)
No	0 (0)
<b>What do you do with the expired medicines?</b>	
Throw them	375 (97)
Return	7 (2)
Keep	3 (1)
<b>What do you do with the unused medicines?</b>	
Throw them	17 (4)
Return	4 (1)
Keep	364 (95)
<b>How did / do you dispose expired or unused medicines?</b>	
Throw them in household garbage / bin	232 (60.3)
Flush down the sink/toilet	117 (30.4)
Return to a pharmacy/clinic	11 (2.8)
Burning/Burying them in ground	25 (6.5)

**Figure 1.** Class of medicines remained unused or expired among households (n=385).

and attitude on disposal methods of expired and unused medicines among residents of Olympia, Woodlands, Kanyama and Mtendere in Lusaka District, Zambia. The study was cross-sectional, questionnaire-based conducted in 385 households of which majority households were from high densely populated area (Kanyama). Majority (94.5%) of the participants in this study reported that they had never received any information about the safe and proper way to dispose expired or unused medicines. The few (5.5%) participants who had received information reported obtaining such information from health professionals. This finding is consistent with studies conducted in the Kingdom of

Saudi Arabia (Alazmi et al., 2017), Kenya (Ang'ienda, 2017) and in Malaysia (Fatokun et al., 2011) where majority of the participants (80, 96 and 86% respectively) had never received any information on safe disposal of expired or unused medicines.

More than half of the participants (55.1%) showed correct understanding of medication waste and its effect on the environment if disposed improperly. Similarly, studies conducted in Ethiopia and India showed that 86 and 74.2% of participants respectively, understood the impact of improper disposal of households medicine on the environment (Shivaraju et al., 2017; Ayele and Mamu, 2018). In this study, 67.3% of the participants



**Figure 2.** The reasons participants had expired or unused medicines among households (n=385).

showed willingness to use pharmacy take-back programmes of expired and unused medicines if introduced in communities. Similar study findings were obtained by Husain et al. (2017) in Pakistan, where majority (58.3%) of the medicine consumers were willing to take part in a pharmacy take-back program (Husain et al., 2017). In Jeddah and Saudi Arabia, similar results highlighting the need to establish a pharmacy take-back programme were reported (Alazmi et al., 2017). A pharmacy take-back program of expired and unused medicines if implemented would provide appropriate disposal method and may lessen likelihood of environmental pollution. A pharmacy take-back program affords communities with easy, safe, and effective means to dispose of their expired or unused medicines by taking them back to the nearest retail pharmacy or hospital (Lubick, 2010; Athern et al., 2016).

Additionally, majority (76.6%) of the participants strongly agreed that they should be more educated on the safe disposal methods of expired or unused medicines. Comparable study results were reported in India, where 77% of the participants felt the need for more awareness among consumers regarding safe disposal methods (Sonowal et al., 2016). Further, the participants suggested that the awareness of safe medicine disposal should be mainly conducted through the media (40.2%) followed by counselling by doctors (18.2%) and pharmacists (13.0%). These results are consistent with what other studies reported in Ethiopia and Pakistan (Ayele and Mamu, 2018) and Pakistan (Husain et al., 2017).

When asked what participants did to expired or unused

medicines, 97% of the participants responded that they threw away expired medicines while 95 % reported to keep unused medicine in their homes. When asked about how the expired or unused medicines are disposed, 60.3% of the participants indicated that they mainly disposed expired or unused medicines in household garbage followed by flushing in toilets/sinks (30.4%). Comparable findings were reported in earlier studies where disposing in garbage/bin was the predominant disposal method (Swaroop et al., 2015; Annavarapu et al., 2016; Shivaraju et al., 2017) followed by disposal in the sink / toilet (Ang'ienda, 2017). Similarly, studies in Saudi Arabia showed that 79.2% of respondents disposed via household garbage/bin (Al-Shareef et al., 2016). However, different results were reported by Orina, (2018) in Nakuru town, Kenya, where the most commonly (27.3%) used method of disposal was flushing in the toilet (Orina, 2018). The differences in the findings of these studies may reflect the disparity between regulations and advice in these regions. Other countries have developed consistent programmes on safe disposal methods as well as institutional and regulatory framework that govern disposal of expired and unused medicines.

In this study, 2 and 1% of the respondents reported returning expired and unused drugs to the pharmacy respectively. This is similar to a study done in Ethiopia which reported that 2.2 and 1% of expired and unused drugs were returned to the pharmacy respectively (Ayele and Mamu, 2018). Comparable results were also found in Saudi Arabia that reported that 1.7% of respondents returned the expired and unused drugs to a pharmacy (Al-Snafi, 2017). Other studies have reported slightly high

returning rate of expired or unused medicines to the pharmacy like 12.3% in Pakistan (Husain et al., 2017) and 31.3% in India (Shivaraju et al., 2017). Poor pharmacy take-back attitudes of medicines observed in our study could be attributed to lack of a policy on disposal methods of expired and unused medicines and poor/lack of dissemination of information by healthcare professionals to the public and patients in particular on how to safely dispose expired or unused medicines.

Additionally, all the participants in this study indicated keeping unused or expired medicines at home. Similar findings were reported in Pakistan by Husain et al. (2017) where more than half of the participants stored unused medications in their homes (Husain et al., 2017). In India, a similar study found that majority of the respondents stored unused medicines at home (Sonowal et al., 2016). Keeping of unused medicines in homes can lead to self-prescribing which promotes irrational medicine use. It was established that majority (45.9%) of the participants kept expired or unused medicines because they had improved symptoms, followed by having excess quantity (29.9%) and reported side effects (21.9%). Other studies have equally reported comparable reasons of keeping unused medicines (Sonowal et al., 2016; Makki et al., 2019). The results suggest a lack of adherence to medications among the majority of participants. In this regard, adequate patient counselling on adherence to medications by prescribers and pharmacists would be important. Majority (55.9%) of the participants in this study indicated disposing mainly antimicrobials followed by analgesics (34.1%). This is comparable to a study conducted in Kenya where the most commonly (35.8%) disposed medicines among participants were antimicrobials followed by analgesics (14.4%). However, opposite results were obtained in Ethiopia (Ayele and Mamu, 2018) and Malaysia (Makki et al., 2019) where analgesics were the most disposed medicines followed by antibiotics.

## Conclusion

This study revealed that majority of participants lacked adequate information regarding the safe disposal of unused or expired medicines. The practice of keeping unused medicines at home and that of throwing expired medicines was very high in this study. Unsafe disposal practice of unused or expired house hold medicines was observed among the participants. However, majority of the participants requested the need of introducing state run disposal systems like drug take-back program in order to promote safe disposal of unused or expired house hold medicines within their communities.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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