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Original Research Article

Knowledge, attitude, and practices on disposal methods of expired and unused medicines among students in public academic institutions in Lusaka, Zambia

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ABSTRACT

Background: Unsafe disposal of unused and expired household medicines is a public health problem and mostly occur because of a lack of knowledge towards suitable medicine disposal methods. Thus, we aimed to assess the knowledge, attitude, and practices on the disposal methods of unused and expired medicines among students in public academic institutions in Lusaka, Zambia.

Methods: This was a cross-sectional study in which 385 students from three higher learning academic institutions were interviewed face to face using a structured questionnaire from 10th May to 24th June 2019. The cleaned data was then transferred to statistical package for social science (SPSS) version 25.0 for analysis.

Results: The mean age of the participants was 23 (SD±2.9). Out of the 385 participants, 215 (55.8%) did not know much about medical waste and 345 (89.6%) of them did not have any previous information regarding proper and safe disposal of unused and expired medicine. However, 351 (91.4%) of the participants appropriately responded that unsafe disposal of unused and expired medicine poses a threat to human health and can harm the environment. Throwing unused and expired medicine in household garbage/bin was the most frequently used disposal practice followed by flushing them in toilet/sink as responded by 231 (60.0%) and 128 (33.3%) of participants respectively. Only 17 (4.42%) reported returning unused and expired medicines to the nearest pharmacy.

Conclusions: The majority of the study participants used unsafe methods to dispose of unused and expired medicine. However, most of the participants acknowledged that unsafe disposal of unused and expired medicines is a public health problem and proposed the need to introduce drug take-back programs in the communities.

Keywords: Attitude, Disposal methods, Expired medicines, Knowledge, Practices

INTRODUCTION

Medicines are important in saving lives but can cause detrimental effects if inappropriately consumed and managed.¹ Globally, there is an increase in medicines consumption due to growth in health-seeking awareness

and behaviour.² However, consumers may not complete all dispensed medicines due to poor adherence, discontinuation of medicines, adverse effects, medicines expiring, forgetting to take the medicines among many other reasons.^{3,4} With the concern of expired and unused medicines, consumers need to know how to dispose of

these pharmaceutical waste products.⁵ Knowledge on proper disposal of pharmaceutical waste is important to avoid consumers disposing of pharmaceutical wastes through environmentally unfriendly methods such as toilet, garbage and sink.⁶

Globally, some studies have been done on knowledge, attitude and practices regarding the disposal of expired and/or unused medicines by students.^{6,7} In Africa, unused medicines disposal management appears to be more critical as reports from around the continents like Mozambique, South Africa, Kenya and Swaziland, indicating unsafe disposal practices characterized by unregulated, illegal and indiscriminate disposal of medicines. In 2014, a study in Ghana determined how resident students of Konongo-Odumasi in the Ashanti region dispose of their unused, unwanted and expired medication.⁸ According to the responses, most students throw medicines in the waste bin (29%), dig a hole in the ground and bury the medication (38%), flush the medication down the toilet or sink (4%) and give their relatives and friends (21%).⁸

Despite different studies that have been conducted in different parts of the world to show the knowledge and attitude towards disposal of expired and unused medicines by students, the knowledge and attitude of Zambian students on safe disposal of expired and unused medicine are unknown as there is currently no system that has been put in place by the regulatory authority on how to handle expired and unused medicines at the Universities or household level. Furthermore, there has not been any published study on the assessment of knowledge and attitude on disposal methods of expired and unused medicines in Zambia among students. Therefore, we assessed the knowledge, attitude and practices on the methods of disposal of expired and unused medicines among students in three government high learning institutions in the Lusaka district of Zambia.

METHODS

This was a cross-sectional study conducted among students from the three higher learning institutions in Lusaka, Zambia, namely, the university of Zambia (UNZA), national institute of public administration (NIPA) and Evelyn Hone college (EHC) from 10th May to 24th June 2019.

Study population

The study population was of either gender who were students at UNZA, NIPA and EHC in all the years of study and were all above 18 years regardless of their cultural, religious, educational, and social backgrounds.

Sample size/ sampling

The sample size was calculated using the single proportion formula: $n = Z^2 p (1-p) / e^2$ and assuming p value of the 50%,

margin of error 5%, confidence interval of 95%, since the study population size was greater than 10,000 and the prevalence was not known.⁹ The estimated sample was $n = (1.96)^2 (0.5)(1-0.5) / (0.05)^2 = 384.16 = 385$ participants. For each institution, $n =$ approximate number of students in the residential area/total number of students in all the residential areas $\times 385$ participants.

According to the database from the three named institutions, the numbers of registered students were 18,235, 10,225 and 9850 for UNZA, EHC and NIPA respectively. The approximate total number of registered students in all the Institutions was 38,310. The apportioned number of participants per institution based on the total population at each institution was as follows: For UNZA, $n = 18235/38235 \times 385 = 184$ participants, for Evelyn Hone college, $n = 10,225/38235 \times 385 = 103$ participants and for NIPA, $n = 9850/38235 \times 385 = 98$ participants. To reach this representative sample size, a non-probability sampling technique (Convenience sampling) was employed in this study.

Data collection

This study was conducted via a face-to-face interview using a structured questionnaire adapted from previous studies.^{10,11} The questionnaire was slightly revised after pretesting to outfit our setting and covered three parts, in which part I comprised demographic characteristics of the study participants being age, gender, level of education and name of the institution. Part II included questions about the knowledge of unused and expired drugs. Part III involved the questions relating to altitude and practices of unused and expired drug disposal.

Data analysis

All the questionnaires were double-checked for accuracy and then the collected raw data feed into Microsoft excel 2019 spreadsheet and data was cleaned. The cleaned data was then transferred to Statistical Package for Social Science (SPSS) version 25.0 for analysis. Descriptive statistics on sample characteristics were computed including mean, standard deviation, frequencies and percentages. The results were presented in reader format figures and tables.

RESULTS

Demographic information

A total of 385 students took part in this study. The majority were from UNZA 184 (47.8%), 103 (26.8%) were from EHC and 98 (25.4%) were from NIPA. The participants' mean age was 23 years (SD: ± 2.9). Among the participants, 221 (57.4%) were females, and 164 (42.6%) were males. Concerning the field of study, 145 (37.4%) participants were doing health programs and 241 (62.6%) were doing non-health programs as presented in the Table 1.

Table 1: Social-demographic profile of participants.

Variables	Characteristics	Frequency (N)	%
Age (years)	Mean 23 (SD±2.9)		
Institution	UNZA	184	47.8
	NIPA	98	25.4
	EHC	103	26.8
Gender	Male	164	42.6
	Female	221	57.4
Field of study	Non-health	241	62.6
	Health	144	37.4

Knowledge on disposal methods of expired and unused medicines

In this study, 215 (55.8%) did not know about medical waste and 345 (89.6%) of them had not previously received any information about the safe and proper way to dispose of expired, leftover and unused medicines. However, 270 (70%) of participants responded that improper disposal of expired and unused medicine can affect health and the environment. When asked if they were aware of the drug take-back system, only 20 (5.0%) knew about it. Participants were asked about the best way to educate the public on safe disposal methods of unused and expired medicines, 200 (51.9%) preferred mass media, 100 (26%) pharmacists, 65 (16.9%) doctors and 20 (5.0%) nurses as shown in the Table 2.

Table 2: Respondents' knowledge of unused and expired medicines disposal in public academic institutions in Lusaka, (n=385).

Question/statement	N (%)*
Do you know about medicines waste?	
Yes	170 (44.2)
No	215 (55.8)
Have you ever received any information about the safe and proper way to dispose of expired, leftover and unused medicines?	
Yes	40 (10.4)
No	345 (89.6)
Do you know about the drug take-back system?	
Yes	20 (5.2)
No	365 (94.8)
Can improper disposal of unused and expired medicines affect the environment and health?	
Yes	270 (70)
No	115 (30)
Who is an appropriate person to inform about proper disposal of the un-used or expired medicine?	
Doctors	65 (16.9)
Nurses	20 (5.2)
Pharmacist	100 (26.0)
Media	200 (51.9)

*N: number of the participants

Table 3: Attitude towards unused and expired medicine disposal in public academic institutions in Lusaka, (n=385).

Statements	Strongly agree, N (%)	Agree, N (%)	Neutral, N (%)	Strongly disagree, N (%)	Disagree, N (%)
Children are more vulnerable to the risks associated with unused and expired household medicines	350 (90.9)	25 (6.5)	10 (2.6)	0 (0)	0 (0)
There is a dearth of adequate information regarding safe disposal of unused and expired household medicine	300 (77.9)	20 (5.2)	25 (6.5)	15 (3.9)	25 (6.5)
Pharmacist, doctors and other healthcare professionals must provide advice on the safe disposal of unused and expired household medicines	345 (89.6)	35 (9.1)	5 (1.3)	0 (0)	0 (0)
Drug take-back programs of unused and expired medicines should be introduced in the communities	339 (88.1)	30 (7.8)	10 (2.6)	3 (0.8)	3 (0.8)

Table 4: Participants practices on safe disposal methods of expired or unused medicines in public academic institutions in Lusaka (n=385).

Questions	Responses	F (N)*	Percentage (%)
Have you ever kept unused or expired medicine in your home?	Yes	340	88.3
	No	15	11.7
What do you do with the expired medicines	Throw them	365	94.80
	Return them	6	1.56
	Keep them	14	3.64
What do you do with unused medicines	Throw them	16	4.16
	Return them	2	0.52
	Sharing them	20	5.19
	Keep them	347	90.13
How do you dispose of unused and expired medicine?	Throw them in household garbage/bin	231	60.0
	Flush down the sink/toilet	128	33.25
	Return to a pharmacy/clinic	17	4.42
	Burning/Burying them in ground	9	2.34

*F: frequency of response.

Attitude on disposal methods of expired and unused medicines

Regarding participants’ attitude on disposal methods of expired and unused medicines, results were as presented in Table 3, and they revealed that 350 (90.9%) of participants strongly agreed that children are more vulnerable to the risks associated with keeping unused and expired medicines while 300 (77.9%) strongly agreed that there is lack of adequate information regarding the safe disposal of unused and expired household medicine. Further, the majority 345 (89.6%) strongly agreed that pharmacists, doctors and other healthcare professionals must provide advice on safe disposal methods of unused and expired household medicines. Participants were also asked if they were willing to use a drug take-back program for safe disposal of expired or unused medicines. 339 (88.1%) of the participants strongly agreed that the program be introduced in the communities.

Participants Practices on safe disposal methods of expired or unused medicines

Participants were asked if they have ever stored unused or expired medicines and 340 (88.3%) agreed to have kept unused and expired household medicines. 365 (94.81%) of the participants also indicated that they throw expired medicines, 6 (1.57%) returned them while 14 (3.64%) kept them. On unused medicines, 16 (4.16%) throw them, 2 (0.52%) return them, 20 (5.19%) shared them with friends and 347 (90.13%) of the participants indicated that they keep unused medicines for future use. There were four disposal methods of expired and unused medicines which were used by the participants, the majority of the participants 231 (60.0%) reported throwing in the garbage/bin. This was followed by 128 (33.25%) participants who reported flushing in the sink/toilet, 17 (4.42%) participants reported burning/burying in the ground and 9 (2.34%) reported returning to pharmacy/clinic as shown in Table 4. The most common

classes of medicine kept in households as reported by the participants were antibiotics 150 (39.0%) followed by analgesics 148 (38.4%) and drugs acting in the GIT 70 (18.2%) as shown in Figure 1. Reasons for having unused or expired medicines were mainly due to stopping medications after feeling better 176 (45.7%), followed by the excess quantity supplied 92 (23.9%) and changing medication after experiencing side effects 66 (17.1%).

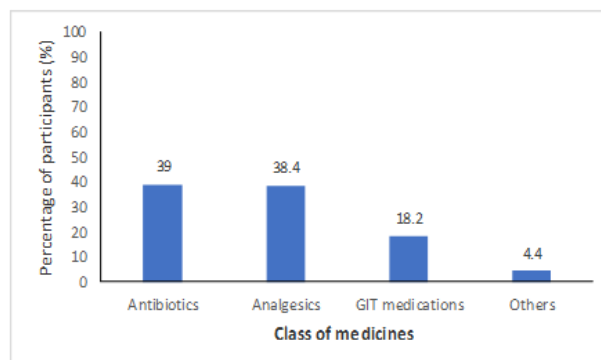


Figure 1: Classes of medicines kept in households.

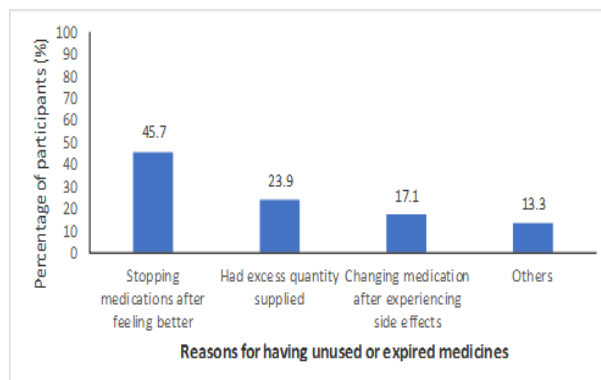


Figure 2: Reasons for having unused or expired medicines.

DISCUSSION

Academic institutions contribute to the accumulation of an enormous amount of expired and unused medicines, and this can damage the environment as well as causing a public health problem.^{7,12} Therefore, our study aimed to assess the knowledge, attitude, and practices on the disposal methods of expired and unused medicines among students in public academic institutions in Lusaka district of Zambia. In this study, 215 (55.8%) of the respondents were not aware of medication waste and this is similar to a study that was conducted in Ethiopia.¹³ However, these findings were lower when compared to a study which was conducted among pharmacy students in Bangladesh in which 63.7% of participants did not know about medication waste.⁶ The difference could be due to the government's variation in the sensitization of proper ways of medicines waste disposal.

Additionally, 345 (89.6%) of the respondents denied receiving any information on the safe disposal of unused and expired medicines from physicians and other health care professionals. This finding is consistent with the findings of other studies.^{6,14-16} This further indicates a need for student education on safe medicines waste disposal through health care professionals and media as suggested by respondents to improve consumers' awareness.

When the respondents were asked if they were aware of the drug take-back program, only a few 20 (5.2%) responded positively. These findings are similar to the findings of another study where only 3.7% of the respondents knew about the drug take-back program.⁶ The low level of awareness regarding the drug take-back program seen in our study could be because of the lack of an established drug take-back systems in our country. In this study, 270 (70%) of the respondent knew about the adverse effects of improper disposal of unused and expired medicines on the environment. These findings are consistent with the findings of other studies where more than half of the participants understood very well the negative impact of improper disposal of unused and expired medicines on the environment.^{11,17,18}

Furthermore, the majority of 339 (88.1%) of the participants strongly agreed that there is a need for the introduction of a drug take-back program to be collecting expired or unused medicines from the communities for safe disposal. Similar results were found in other studies conducted elsewhere.^{15,19,20} A drug take-back program provides an appropriate disposal method and may lessen the likelihood of expired and unused medicines going into the environment and therefore preventing environmental pollution if implemented by the government.²¹

This study established that most of the participants 300 (77.9%) strongly agreed that there is a lack of education on the safe disposal methods of expired or unused medicines. Only 40 (10.4%) had received information regarding the safe and proper way of disposing of the medicines. Our

findings are comparatively lower than the findings of other studies.^{11,13,16} The difference might be ascribed to the lack of public awareness campaigns on safe and proper disposal methods of unused and expired medicines. Additionally, the participants suggested that the awareness of proper disposal methods of unused drugs should be mainly done through the media 200 (51.9%), pharmacists 100 (26.0%), doctors 65 (16.9%) and nurses 20 (5.2%). This finding is highlighted by other studies.^{10,11}

In this study, 340 (88.3%) of the respondents had unused or expired medicines in their household. Other studies have also reported a high proportion of storage of unused and expired medicines in households.²²⁻²⁴ Regarding the risks of storing unused and expired medicines in their homes, 350 (90.9%) of participants strongly agreed that children are more susceptible to the risks related to unused and expired household medicines. Accidental pharmaceutical poisoning in young children is common and therefore, the need to appropriately store and safely dispose of unused and expired medicines.²⁵

When participants were asked what they did to expired or unused medicines, 365 (94.8%) of the participants responded that they threw away expired medicines while 347 (90.1%) reported keeping unused medicine in their homes and 20 (5.2%) shared them with their friends. This finding is in contrast with a study done in Nepal among paramedical students where a relatively low proportion of the participants threw and kept expired and unused medicines.²⁶ The difference in the findings could be attributed to the nature of participants as all the participants in Nepal were doing health courses and likely to receive appropriate information during their training regarding disposal of unused and expired medicines, unlike our study which consisted of a mixture of students doing health courses and non-health courses.

Additionally, 231 (60.0%) of participants preferred disposal practice for both unused and expired medicine was throwing in garbage/bin followed by 128 (33.3%) who flushes them in the toilet. This finding is consistent with studies done elsewhere.^{19,27,28} This study also shows that only 17 (4.4%) of respondents considered returning unused and expired medicine to the pharmacy or health professionals as an appropriate way of disposing of unused or expired medicines. The low percentage might be due to a lack of awareness about the proper disposal of medicines. This reasoning becomes more evident when compared with findings in studies conducted in Sweden, Portugal, New Zealand and the United States of America where a majority of the participants returned unwanted medication to the pharmacy.²⁹⁻³² The difference seen could be due to the existence of systems that encourage proper disposal of unused medicine in Swede, Portugal, New Zealand and United States of America.

Environmental pollution with drugs such as antimicrobial agents has been reported to be a common cause of antimicrobial resistance (AMR) in the environment.^{33,34}

Evidence has shown that the unusual disposal of unused and expired drugs such as antibiotics in the environment can contribute to increased AMR.³⁵ AMR has several consequences including increased utilization of resources, economic and clinical burdens, and increased morbidity and mortality.³⁶⁻³⁸ Hence, all necessary strategies and ethical approach must be put in place to curb AMR.^{39,40} We need to conserve our environment by avoiding the disposal of unused and expired drugs in the environment.

Limitations

This study was based on three public institutions in Lusaka only and therefore there is need to conduct a study that includes more public institutions countrywide as well as private institutions to ensure generalization of research findings. We might have also encountered misclassifications of the information due to susceptibility of this nature of a study to recall bias and subsequently affecting true disposal practices. However, we adopted the widely accepted data collection tool which contain carefully selected questions.

CONCLUSION

This study revealed that participants from the three higher learning public institutions had a low level of knowledge on safe disposal methods of expired and unused medicines. Besides, the participants practised discouraged methods of disposing of unused and expired medicines. Conversely, the majority of the participants had a positive attitude towards safe disposal methods. Therefore, there is a deep need to create awareness campaigns and setting up drug take-back programs to ensure that the unused and expired medicines are disposed off safely and appropriately.

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