



KNOWLEDGE, ATTITUDE AND PRACTICE TOWARDS DISCARDING UNWANTED HOUSEHOLD MEDICINES AMONG UNIVERSITY STUDENTS IN WESTERN REGION, KSA

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ABSTRACT

Improper disposal of medicines can lead to increase security, health and environmental risks. In this study, we evaluated the awareness and pattern of practice regarding drug disposal among university students in the Western Region of Saudi Arabia. A Cross-sectional research design using convenience sampling technique was used in this study. 1446 respondents successfully responded to this study. More than Three quarter (76.9%) of which have had the experience of discarding drugs. Discarding unwanted medicines via household waste baskets was the most popular method followed by disposing drugs via drainage. Only a quarter of respondents have previously received information about how to dispose medicines. Drug dosage form and amount of drug were important factors. Low awareness level of respondents and the lack of systems instructing the re-collection of unwanted household medicines may be the main reasons linked to their irrational method of drug disposal. Not failing the importance of awareness programs, introducing such drug-disposal systems would improve the outcomes.

Keywords: Unused medicine, Unwanted Drug, Saudi Arabia

INTRODUCTION

Disposal of unused prescribed medicines has been a raising concern due to security and environmental reasons^{1,2}. Improper disposal of medicines may permit easier access to those medicines particularly by children^{3,4} and addicts^{5,6}. Discarded medicines can also pose an environmental risk as drug residues may be dispersed to waste water, ground water^{7,8}, surface water⁹⁻¹¹ and drinking water¹²⁻¹⁵. There have been number of recent reports indicating the existence of pharmaceutical compounds and their metabolites in the environment^{2,11,15-18}. Levels of these pharmaceutical compounds detected in water were at concentrations ranging from nanograms to micrograms per liter^{11,13,15}. Although, whether or not the detected levels of these medicines will exert chronic effects in human or animals remain doubtful^{17,19}, a growing evidence shows possible impacts on the environment. For instance, traces levels of steroidal estrogens (used in oral

contraceptives) were detected in rivers contaminated with swage, and linked to impaired sexual development and increased feminization of exposed fish²⁰⁻²². Likewise, antibiotic levels detected in waste waterways have been shown to possibly exert effects on bacteria as it may lead to increased resistance²³. Whilst, expired drugs in storage, change of treatment, death, improved health condition, over-prescription and obtained Over-the-counter drugs being the major source of discarded medicines, the types of non-required pharmaceuticals were varied enormously²⁴⁻²⁹. While regulations regarding drug dispensing are in act in many countries, the control of household drug disposal remains a challenge especially in developing countries^{26,30}. In Sweden²⁷ and New Zealand²⁵, public are encouraged to return unwanted medicines to pharmacies, by what is called Take-Back programs. Collected drugs are then sent to incineration stations for proper disposal. In the United States (US), in addition to similar Take-Back programs, guidelines regarding how to discard unwanted household drugs

are issued by different governmental agencies such as the Food and Drug Administration (FDA) and Environmental Protection Agency (EPA) ^{5,31}. The FDA advises that if the Take-Back program is not available, certain drugs are listed dangerous and should be flushed down the toilet³². The other drugs can be thrown in the household garbage but after the they crashed and/or mixed with inert substance like coffee grounds^{5,24}.

In Kingdom of Saudi Arabia (KSA) there is an act issued in 1999 by the Ministry of Health and another issued in 2001 by the Gulf Countries Council (GCC) regulating the management of medical waste including unwanted pharmaceutical compounds. However, these acts are not specific when they come to receiving and disposing returned medicines from the public. There is also no take-back program to accept unused prescribed drugs from public. Therefore, there is an increased demand for research that define general public knowledge and practice towards discarding medicines and assess the level of awareness about the environmental risk resulting by inappropriate drug disposal. This would help decision makers to design effective awareness programs as well as considering to establish new household drug disposal programs to target those who need to discard unused prescribed medicines.

Up to our knowledge, no study has been found to investigate general public perceptions or practice towards discarding household medicines in general in KSA. Thus, this study focuses on the household medicine disposal practices currently used in the Western Region of Saudi Arabia among university students.

METHODOLOGY:

Study design: A Cross-sectional research design using non probability convenience sampling technique was used in this study.

Data collection tool: The questionnaire: The questionnaire was developed after extensive literature search in the known databases. A first draft was then developed and validated through an expert team of researchers from College of Pharmacy at Taif University. Then, the final draft of the questionnaire was translated into Arabic language and verified by the researchers at the College of Pharmacy. Final draft of the Arabic version was piloted on 20 respondents to get their feedback on the questionnaire draft.

Questionnaire was divided into four parts. First part included the respondents' demographics such as age, gender, and educational level. Second part included

respondents' source of information regarding medicines and respondents' knowledge regarding drug disposal. Third part was designed to measure respondents' practice towards discarding medicines. Final part included questions to reveal respondents' practice regarding preferred way of disposing medicines at different dosage forms. Answers were designed to be close-ended. In which answers were either dichotomous (Yes, No) or select from multiple choices.

Data collection procedure: Researcher met with respondents in three universities in the western region of Saudi Arabia. These are Taif, King Abdul-Aziz and Um-AlQura universities located in Taif, Jeddah and Makkah cities respectively. Researchers introduced themselves to the respondents and then informed them that no findings which could identify them will be published and all information will be kept confidential. Once respondents give their agreement to participate in this research, researchers gave them the questionnaire which did not take them more than 10 minutes to complete.

Data collection time frame: Data collection was started during the autumn semester from 25th of September 2013 until 30th of December 2013.

Data collection areas: Data was collected from university students who currently studying in any of the three universities in the western region (Taif University at Taif city; Um al-Qura University at Makkah city and King Abdul-Aziz University at Jeddah city).

Data analysis: Descriptive analysis was used to describe the frequencies and percentages whereas, Chi square and Fisher Exact tests were used to compare the results with different demographics of the respondents like gender, age living area, nationality & education. All analyses were used 95% significant level & any alpha value of less than 0.05% was considered significant.

RESULTS

Respondent's demographics: A total of 1446 university students successfully responded to this study. Most of the respondents (93.2%; n=1348) were males. The majority of respondents Saudi citizens (96%, n=1386). Difficulty were experienced in recruiting more female respondents due to the fact that Saudi culture and costume prohibit male researchers from dealing directly with adult females. Saudi citizens make up the majority of the university students in the KSA and this reflected on the number

of non-Saudi students participated in this study. Majority of respondents live in urban areas (83%, n=1186). More than a third of respondents (35.5%, n=515) have a family member with chronic illness. Table 1 summarizes the details of respondent's demographics

Table 2 shows respondents' knowledge regarding unused household drug discard. Sixty percent of responded students believed that discarded medicines may have a harming impact on the environment. Only 30% of female respondents believes that the discarded medicines can affect the environment while the percentage of the male respondents who thought discarded medicines would affect the environment were double the females (62.3%, $p < 0.001$). Only approximately quarter of the respondents said that they have previously asked or received information from a person works in a medical field about how to properly dispose medicines. Interestingly, respondents who are females or living in rural areas (43.2% and 32.6% respectively) were more subject to receive information about how to discard medicines compared those who are males or living in urban areas (22.6% and 22% respectively). Similarly, only as little as 17.6% of respondents who attended King Abdul-Aziz University in Jeddah have received such information compared to those attended universities in Taif or Makkah (26.2 and 26 % respectively). On the other hand, three quarter of respondents believe that such information about how to discard medicines is important to be given to community members.

Table 3 describes the practice pattern of participated respondents towards medicine discard. Data shows that more than three quarters of respondents (76.9%, n=1101) have had the experience of discarding medicines. Among the respondents in this study, high percentage of males (80.5%, n=1078) and singles (78.6%, n=1013) have had this experience, whereas, students at year 1 of their university study were less practiced disposing medicines compared to other groups of students ($p < 0.001$). Just above the half of respondents said that they contain medicines in a sealed bag or container before disposing (53.1%, n=760). Male respondents were as twice as much the females to conceal the unwanted drugs before discarding (males = 55%, females 26.3%). The expiry of medicines was the main cause of drug disposal for the majority of respondents (50.3%, n=721). The majority of respondents did not pay attention to drug leaflets before discarding unwanted drugs. Not unlike to the above, a total of 37.1% of respondents said that they ask a physician (16.3, n=233) or a pharmacist (20.8%, n=298) for information regarding how to dispose drugs. Interestingly, female respondents and those who are

singles or belong to a smaller family were more relying on their own when taking decisions about how to discard medicines. When asked about the key aspect that is considered when disposing medicines, almost a third of respondents said that the amount or volume of medicine is the most important factor (31.2%, n=447), while the price of the medicine were the least of their concerns (5.7%, n=108).

Table 4 shows the respondents' preferred way of disposing medicines of solid or liquid dosage form. Regardless of the dosage form, disposing drugs by throwing them into household waste basket was the preferred way for almost 2 thirds of respondents. Forty six percent of respondents said that they dispose solid dosage form drugs by throwing them directly to the waste basket without crashing them, and only 16.1% of respondents said that they crush the tablets before discarding. Comparatively, 49.5% of respondents practice discarding liquid dosage form drugs by a direct throw into waste basket, while 16.9% (n=242) empty the containers in the waste basket before throwing it. A minor percentage of respondents said that they would mix the solid or liquid dosage forms drugs another product before discarding in the waste basket (3.9% and 5.6% respectively). Only as little as 1.7% (n=24) and 1.1% (n=16) of respondents returns unwanted unused solid dosage form medicines to the pharmacy or doctor, respectively. Similar results were also obtained for the number of respondents who returned liquid dosage form drugs to the pharmacy (2.4%, n=34) or the doctor (2.8%, n=40).

DISCUSSION

This study aimed to evaluate the knowledge, opinion and practice of university students in the Western Region of Saudi Arabia towards discarding unwanted household medicines. A total of 1446 respondents were successfully responded to this study. University students represent a diverse population of the local community. Targeting university students will also allow ruling out the risk of interviewing those who short-stay. Therefore, the population of university students may correspond to a wide cross section of the educated community of Western Region of Saudi Arabia. The large proportion of singles among respondents was expected as the majority of respondents are young (96% less than 25 years old).

The results show that more than three quarters of respondents claimed to experience disposing unwanted medicines. Two thirds of respondents discarded unwanted medicines in the household waste basket. Whereas, disposal by flushing drugs

dawn the toilet or sink was the preferred choice for approximately quarter of respondents. Only a small proportion of respondents do return unwanted medicines to a pharmacy. These results are comparable to those obtained by researchers in Kuwait³³ were 76.5% of respondents throw unwanted household medicines in waste basket and 11.2% use drainage as a disposal method. With the exception to a small group of drugs, incineration is the most recommended method for medicine disposal³⁴. Discarding drugs to household waste baskets is considered the best option when incineration programs are not available^{5,24}. Medicines discarded in waste baskets destined for landfill are believed to remain somehow contained in the landfill area and thus stay less harmful to environment compared to drugs flushed down the drain². Regardless of the dosage form, all forms of drugs are become in liquid form after they are flushed down the toilet. Analysis using analytical methods demonstrated that traces of pharmaceutical compounds are still detectable in water even after treatment and purification^{35,36}. In the light of these findings, the disposal habits of students in Western Region of Saudi Arabia are considered better than those reported in the US³⁷. In the US, 54% of households threw unwanted medicines in waste baskets and 35% disposed drugs via waterways. Only around 5% of respondents in our study return unwanted leftover medicines to the pharmacy or the doctor. The results obtained here show that students' practice toward disposing medicines is not even close to the practice of community in countries where people are encouraged to return unused leftover medicines to pharmacies or designated collecting points. For instance, in Swedish phone survey, approximately 42% of the respondents said that they returned unused medicines to the pharmacy, and around 73% said that they would return unused drugs to the pharmacy if they had any²⁷.

The majority of respondents (60%) believe that improper way of disposing medicines may lead to harm the environment. Three quarters of respondents believe that community members should be informed about how to properly discard unwanted medicines. Only 3.1% of respondents asked the pharmacist or the physician drug disposal, and only about a quarter of respondents have received information about how to properly dispose medicines. These results may indicate that although the majority of respondents were up to some level aware of the possible environmental risks linked to drug disposal, only a minor percentage of respondents have had the knowledge of how to correctly practice the drug disposal. Increasing general public awareness is vital as most of drugs are not controlled after dispensing. Regardless whether the unwanted drugs were initially obtained as OTC or by prescription, the monitoring of these drugs disposal is down to the user. Introducing programs such as "take-back" program, would also encourage general public to safely dispose unwanted drugs by returning them to certain collection points.

CONCLUSION

The majority of respondents in this study confirmed to practice irrational method of drug disposal. Reasons may be linked to the low awareness level of respondents as well as the lack of systems instructing the re-collection of unwanted household medicines. Introducing such drug-disposal systems would improve the outcomes, not failing the importance of awareness programs in encouraging the public to contribute to these safe drug-disposal systems. Studies are warranted to address the existence and possible effects of disposed drugs on environment in the KSA.

Table 1: General characteristics of the respondents

Demographic characteristics		Frequency	Percentage
Gender	Male	1348	93.2
	Female	98	6.8
Age	≤20	175	12.1
	20-25	1214	83.3
	>25	57	3.9
Nationality	Saudi	1386	96.0
	None Saudi	58	4.0
Education Level	1 st year	285	19.7
	2 nd year	266	18.4

	3rd year	383	26.4
	4th year	272	18.8
	5th year	158	10.9
	6th year	78	5.4
Marital Status	Single	1298	90.0
	Married	119	8.3
	Widowed/Divorced	25	1.7
City Name	Makkah	587	40.5
	Jeddah	378	26.3
	Taif	480	33.2
Residence	Urban	1186	83.0
	Rural	242	17.0
Family Members	< 5 members	335	23.3
	5-10 members	917	63.8
	> 10 members	185	12.9
Chronic	Yes	515	35.5
	No	917	63.5

Table 2: Knowledge Regarding Medicine Discard

Section	Responses		Gender	City	Age	Education level	Residence location	No. Family Members
	Yes (n) (%)	No (n) (%)						
Do you believe that inappropriate discard of medicines may harm the surrounding environment?	862 (60.2)	570 (39.8)	<0.001	0.240	0.645	0.005	0.019	0.023
Have you received information about how to properly discard leftover medicines from someone who works in the medical field?	343 (23.9)	1089 (76)	<0.001	0.009*	0.953	0.478*	0.001*	<0.001*
Have you asked anyone who works in the medical field about how to properly discard leftover medicines?	354 (24.7)	1080 (75.3)	<0.001	0.237	0.177	0.004	0.119	<0.001
Do you believe it is necessary that community members should be informed about how to properly discard leftover medicines?	1053 (73.5)	379 (26.4)	<0.001	<0.001*	0.040	0.189*	0.025*	0.001*
Do you think that there is difference between discarding expired and non-expired medicines?	827 (57.9)	601 (42.1)	<0.001	0.002	0.113	0.172	0.092	0.533

*Fisher exact test

Table 3: Practice Regarding Medicine Discard

Section	Yes n (%)	Gender	City	Age	Education level	Residence location	No. Family Members
When do you decide to discard leftover medicines?		<0.001	0.175	0.405	0.203	0.005	0.005
They are expired	721 (50.3)						
I complete the prescribed full course	455 (31.8)						
I notice change in the medicine color	114 (10.1)						
Others	112 (7.8)						
Have you ever dispose or discard medicines?	1101(76.9)	<0.001	0.499*	0.052	<0.001*	0.392*	0.005*
What do you do when you are not sure about how to discard the leftover medicines?		<0.001	<0.001*	0.042*	<0.001*	<0.001*	<0.001*
Ask the doctor	233 (16.3)						
Ask the pharmacies	298 (20.8)						
Read the instruction leaflet	190 (13.3)						
I make the decision by myself	671 (46.9)						
Other	38 (2.7)						
Which factor of the followings is considered the most important when discarding medicines?		<0.001*	0.028	0.009	0.472	<0.001*	0.001*
The dosage form	363 (25.4)						
The amount/volume of the medicine	447 (31.2)						
The type/shape of the medicine package	137 (9.6)						
The type of the medicine	294 (20.5)						
The price of the medicine	82 (5.7)						
Other	108 (7.5)						
Do you place medicines in a sealed bag or container before discarding?	760 (53.1)	<0.001	0.004	0.566	0.285	0.015	0.076

*Fisher exact test

Table 4: Respondents' preferred way of disposing medicines of solid or liquid dosage form

Section	Yes n (%)	Gender	City	Age	Education level	Residence location	No. Family Members
How do you discard solid dosage form medicines?		<0.001	<0.001*	0.134	0.002*	<0.001*	<0.001*
Throw it in the toilet without cracking or crashing them	227 (15.8)						
Throw it in the toilet after cracking or crashing them	230 (16.1)						
Throw it in the waste basket without cracking or crashing them	659 (46)						
Throw it in the waste basket after cracking or crashing them	194 (13.5)						
Return it back to the pharmacy	24 (1.7)						
Return it back to the doctor	16 (1.1)						
Mix it up with another product then I throw it in a waste basket	56 (39)						
Other	27 (1.9)						
How do you discard liquid dosage form medicines?		<0.001*	0.013*	0.012*	<0.001*	0.003*	<0.001*
Empty it in the toilet/sink	287 (20)						
Throw it in the waste basket without emptying	710 (49.5)						
Throw it in the waste basket after emptying	242 (16.9)						
Return it back to the pharmacy	34 (2.4)						
Return it back to the doctor	40 (2.8)						
Mix it up with another product then I throw it in a waste basket	80 (5.6)						
Other	40 (2.8)						

* Fisher exact test

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