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MEDICATION DISPOSAL;

HOUSEHOLD PRACTICES IN KARACHI, PAKISTAN. NEED FOR A MEDICATION TAKE-BACK PROGRAM.

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ABSTRACT… Introduction: Due to irresponsible and unsafe methods of drug disposal employed by consumers pharmaceutical waste enters the ecosystem, ultimately having a detrimental effect on both human health and environment. **Objectives:** The purpose of the study is to measure attitude and practice of local community in Karachi, Pakistan regarding safe disposal of unwanted medicines and assess willingness of participants to take part in a medication-take-back program. **Study Design:** A two-phase observational study was conducted using convenience sampling. **Period:** January to February, 2016. **Methodology:** In Phase I (n = 200) students enrolled in various health sciences institutions in the study were asked to take part in the survey. In Phase II(n = 300) household consumers were contacted by telephone and social media. **Results:** Participants (response rate 84.4%) were given a questionnaire to explore their attitudes towards medicine disposal. More than half of the consumers surveyed reported storing unused/expired medications in their homes, and majority threw away unwanted medicine in the garbage. The most common reason was unawareness of expiry date (32.7%). Only 12.32% reported returning medication to a pharmacy for disposal. Majority of the consumers had never received advice about medication disposal by a health care provider but were aware of the possible negative consequences and were willing to participate in national pharmacy take-back programs if implemented by the government. **Conclusions:** Our findings suggest that effective communication and established protocols will promote appropriate disposal practices. Public services in Pakistan, and especially pharmacies, must play a more proactive role in this regard.

Keywords: Pharmaceutical waste, observational study, pharmacy take-back program, Pakistan, environment.

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INTRODUCTION

There has been a dramatic increase in the use of prescription and over the counter (OTC) medications throughout the world[1], but patients may not use all the medications prescribed to them as a result of noncompliance, adverse effects, changes in therapy, or medications reaching the expiration date, thereby unintentionally stock piling unused or expired medications in homes.[2] It has been estimated that billions of dollars' worth of unused medication is wasted every year.[3] Apart from the threat of misuse, unused medicines in the home can often be ingested by children and pets.[4] Many studies state that people generally disposed of medication inappropriately by flushing them down the toilet/sink or discarding them in the garbage, these practices have hazardous consequences to the environment resulting in polluting the water, causing harm to aquatic life and detrimental effects on the soil for agriculture.[5-7] It is established fact that most municipal wastewater treatments systems cannot remove drugs from the wastewater.[8] Particularly for Pakistan there are very few water treatment facilities, only 30% of sewerage water is treated.[9] But disposing of unwanted medication in the trash has its own set of concerns. Medication thrown away with labels still on them contain information which can promote identity theft, accidental exposure to children, pets and wildlife and it can also be a source of pharmaceutical drug diversion and counterfeiting.[10] FDA and WHO

guidelines for pharmaceutical companies and governments exists on the disposal of medicinal waste. Medication take back programs provide a safer way of medication disposal from home, wherein consumers are requested to return unused or expired medication to local community pharmacies, from where they are picked up and transported to waste management facilities for destruction. These take back programs reduce the quantity of drugs available for accidental poisoning or polluting the environment. It is also advised that when disposing the medication personal information should be removed by peeling off the label prior to throwing the container away in the garbage in order to minimize the risk of illegal activities such as drug diversion and personal identity theft. In case a medication take back program is not available FDA lists certain drugs that are especially harmful or even fatal if accidently taken these drugs should be flushed down the sink or toilet.[11,12]

Many developed countries have year-round drug take-back programs, with pharmacies playing a very important role, generally[13] although it has been reported that in some instances pharmacies have refused to take back expired medication.[6] Pharmacists have the greatest interaction with consumers and prescription and non-prescription medications and are therefore, in an excellent position to assess and act on the individual patient's reasons for returning medication and to assist in the safe disposal of unwanted drugs.

In order to understand the current household disposal practices in the local community and to assess the readiness of consumers to participate in remedial programs so as to protect human health and environment, we conducted a two-phase survey in different areas of Karachi, Pakistan.

METHODOLOGY

A cross-sectional, observational two-phase study was conducted using convenience sampling in different areas of Karachi, Pakistan. In the first phase, survey was conducted (n = 200) at health sciences institutions. In the second phase, (n = 300) household consumers were surveyed. Study was conducted during the 6-month period from February 2016 to July 2016. In the pre-tested, self-administered questionnaire, participants were asked questions concerning consequences of keeping unused/ expired medicines at home, methods of medicine disposal commonly employed and their potential environmental impact and implementation of "Pharmacy take back program" in the city. The study was exempted from the need for review by an Ethics Committee.

RESULTS

Cross-sectional observational study was performed using a pre-tested questionnaire in order to determine the drug disposal methods employed by the population of Karachi and to discover the extent of knowledge the targeted population has regarding this practice. The questionnaire was sent to 500 people in total, with a response rate of 84.4% (n=422). Table-I depicts the demographic data of the participants.

		Number of Individuals (N)	Percentage (%)
Gender	Male	172	40.76
	Female	250	59.24
Age (in years)	15-18	25	5.92
	19-25	133	31.52
	26-35	65	15.40
	36-45	100	23.70
	46-60	54	12.80
	60-75	38	9.00
	75+	7	1.66
Education	Under-graduates	178	42.18
	Graduates	178	42.18
	Post-graduates	66	15.64

Table-I. Demographics of participants.

Figure-1. shows the percentage of expired/ unused medicines present in the homes of the targeted population. 54% of the participants claimed to have unused or expired medicines in their homes.

Medicines that were found to be most commonly present in homes are shown in Figure-2. Cough

and cold preparations were the most prevalent medications.

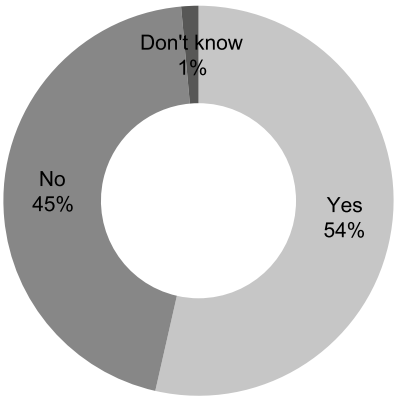

Figure-1. Incidence of unused/expired medicines present in homes

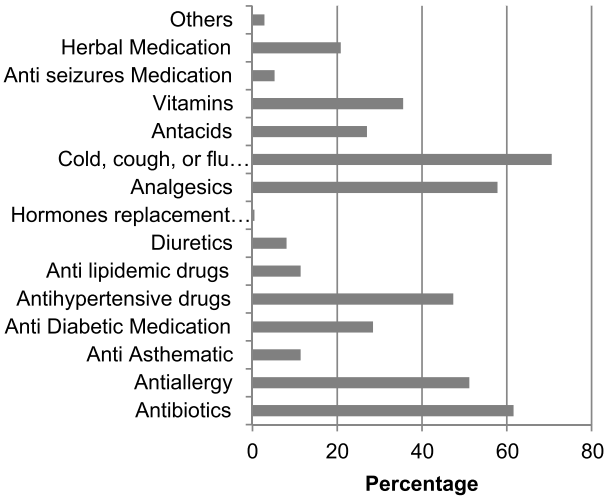

Figure-2. Commonly found medicines

Figure-3 gives common reasons cited by the participants for having unused or expired medicines in their homes, with the main reason being that the expiry date went unnoticed by the consumer.

Participants' responses regarding the potential consequences of keeping such medicines in their homes are shown in Table-II. Accidental misuse was found to be the most commonly feared result of such a practice.

The majority of the participants (77%) had disposed of expired/unused medicines.

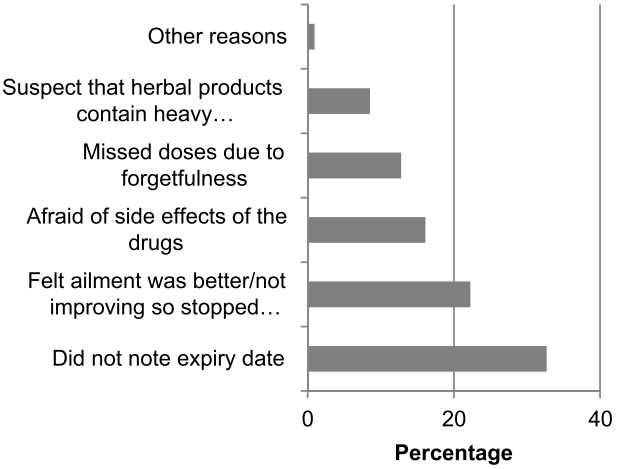

Figure-3. Reasons for having unused/expired medicines in home

The methods commonly employed to dispose of liquid and solid dosage forms are listed in Table-III. Most participants chose to throw unused liquid and solid medicines away in household garbage.

The participants were also asked if they had received any information regarding safe disposal methods and the source of said information. The results can be seen in Table-IV. Most of the population surveyed had not received any instructions regarding safe disposal of medicines and those who had said the hospital/clinic/physician gave them the information.

Most of the participants agreed that a national disposal scheme for medicines should be implemented and that they would be willing to take part in pharmacy take back programs. Table-V. details these results.

DISCUSSION

The purpose of this study was to discover drug disposal practices and related attitudes and beliefs of common public towards disposal of unused medications in homes. Self-administered questionnaires were given out in several health sciences institutes and household users of Karachi, Pakistan. As can be seen in Table-I, majority of the respondents were female, aged 19-25 years. Graduates and undergraduates were equally represented.

What are the potential negative consequences of keeping expired or unused medication?				
	Undergraduates	Graduates	Post Graduates	Total
	%	%	%	%
Accidental use or misuse by someone else in the household	28.91	34.60	10.90	74.41
Children could take them	16.59	17.30	13.03	46.92
Diminished or unpredictable effects	11.85	4.27	0.47	16.59
Storage space/clutter	9.95	5.69	0.95	16.59
Environmental Risk	3.79	9.48	0.95	14.22
Other	0.47	0.00	0.00	0.47

Table-II. Perceived negative consequences of keeping expired/unused medicines at home.

	Under-graduates	Graduates	Post Graduates
	%	%	%
Throw away in household garbage	24.88	45.02	2.61
Flush down the toilet or sink	3.55	6.87	1.42
Give to someone else to use	4.27	4.27	3.79
Return to a pharmacy	2.84	4.03	5.45
Return to a physician	1.18	2.37	0.71
High temperature incineration/burning	0.00	0.47	0.00
Other mean of disposal	0.24	0.71	0.47

Table-III. Methods by which participants dispose of medicines

	Undergraduates	Graduates	Post Graduates	Total
Received Information About Appropriate Drug Disposal Methods	%	%	%	%
Yes	2.37	26.77	6.35	35.49
No	39.81	15.40	3.65	58.86
Source of Information				
The pharmacist/pharmacy	0	9.48	2.37	11.85
Hospital/clinic/Physician/other healthcare staff	1.90	8.29	1.90	12.09
City/village/government agency	0.47	0.47	0.71	1.66
Electronic or Print Media	0	2.37	1.90	4.27
Internet	0	4.27	4.50	8.77
Others	0	1.90	2.13	4.03

Table-IV. Awareness of appropriate drug disposal methods.

If there was a Pharmacy take back program (Run by community Pharmacies) where you could drop off unused or expired medications for disposal, how willing would you be to use this method to get rid of such medications?		
	N	%
Very willing	246	58.29
Somewhat willing	66	15.64
Neither willing nor unwilling	62	14.69
Somewhat unwilling	12	2.84
Very unwilling	14	3.32
Don't know	22	5.21
Do you think Pakistan needs a national medicines disposal scheme accessible to all pharmacies across the country?		
	N	%
Yes	409	96.92
No	18	4.27

Table-V. Need of a national medical disposal program.

Ideally, all prescribed medication should be taken until the course is complete. However, a significant proportion of the population fails to completely consume medication and keeps it in their home for future use.[14,15] 54% of the participants claimed to have unused and/or expired medicines in their homes (Figure-1). This practice could have potentially serious health and legal concerns and provides potential for drug diversion in the community.[16,17] There is also great potential of environmental detriment, as has been discussed by Ahmed et al in 2007 (9). Indeed, the presence of trace amounts of diclofenac sodium has already been linked to declining vulture population in Pakistan.[18]

As seen in figure 2, 70.62% respondents claimed to have cough, cold or flu medicines in their homes. It was found that 61.61% had antibiotics, 57.82% had analgesics, 51.18% had anti-allergy medications and 47.39% had antihypertensive drugs in their homes. The high number of antibiotic users is suggestive of a link between emergence of antibiotic resistant strains of microorganisms and misuse of the same.[19-23]

Respondents of the survey have unused medicines for a variety of reason (Figure-3), the most common ones being not noticing the expiration date (32.70%), discontinuation of the medicine (22.27%) on the belief that it was not working or the patient was completely recovered and did not need to follow the full regimen, and fear of potential side effects (16.11%). Proper patient counselling on importance of following the regimen and chances of experiencing an adverse reaction to the drug may take care of most of the reasons for non-compliance.[24,25] However, the fact that majority failed to even see the expiry date suggests that this date should be written in such a way as to be more conspicuous. Perhaps a larger sized or brightly coloured expiry date will be more noticeable. While most of the participants believed that keeping unused/ expired medicines could result in accidental use/ misuse of the same, the second most feared consequence is the accidental intake of drugs by children (see Table-II). Graduates were more concerned than the undergraduates and post graduates with respect to possible environmental hazard of such medicines.

The most common site for discarding unused/ expired medicines was found to be household garbage (Table-III). The results correspond with the findings of Ahmed et al, who surveyed attitudes towards drug disposal by students of the University of Karachi.[9] It was discovered that drug diversion occurs in 12.33% of the responses. This practice may be dangerous even if the medicine is not expired. It may also have legal implications if the medicine is a controlled substance.[26,27] Post graduates were most likely to return unwanted medicines to the pharmacy. The disposal habits of local consumers were somewhat similar to other countries.[10,28,29]

Although drug disposal is thought to play a minor, perhaps insignificant, role in environmental contamination, research has only begun to ascertain the extent and characteristics of the contaminants derived from the same.[18,30,31]

Most respondents denied ever receiving information about medicine disposal. Those who claimed to have been informed mainly cited hospital/clinic staff or the physician as their source of information. Pharmacists were also found to be a source of relevant information on the same (Table-IV). Furthermore, the internet was a resource for a significant number of people. Chi square test ($p=0.05$) was applied to determine if education level played a part in the receipt of information on drug disposal, but no correlation was found.

96.92% of respondents believe a national medicines disposal scheme needs to be implemented (see Table-V). The majority professed a willingness to take part in a pharmacy take-back program. In many developed countries, some forms of reverse distribution system or occasional take back campaigns have been launched such as www.disposemymeds.org (USA), www.takebackyourmeds.org (Washington State, USA), www.returnmed.com.au (Australia) etcetera, and a similar system could be introduce in Pakistan. However, suitable measures would need to

be in place to ensure the security of returned medication to prevent diversion of narcotic and psychotropic drugs to illicit use.[32,33] Community pharmacists' involvement would be central given that only 12.32% of the consumers had returned medicines to a pharmacy despite the majority's willingness to utilize a take-back program (Table-III). However, a study by Rabbani et al discovered that only 12% of retail pharmacies in Karachi actually employ qualified pharmacists.[34] This situation must also be corrected in order to strengthen the overall health care system in Pakistan.

Another initiative that is increasingly popular in developed countries is prescription drug "recycling/redistribution" wherein unused prescription drugs are given away to poor patients while following specific laws and requirements.[35] Considering that we are a third-world country, this has the potential of decreasing our healthcare cost as a nation. As Mackridge and Marriott have suggested, medicines may even be imported from other countries for this purpose.[35]

CONCLUSION

The study indicates that there is a need for distributing information about proper disposal methods of unwanted medications. The health and environmental impact of drugs improperly disposed of are still being established. Drug diversion is also a significant problem, especially with respect to antibiotics and controlled substances. Thus, it seems prudent to set up and implement a system to handle this issue. Pharmacy take back and recycling programs both have potential benefits to offer. The onus is on the government to take steps to safeguard the health and wellbeing of this land and its people. Community pharmacists also need to play a greater role in order to ensure widespread dissemination of knowledge about proper use and disposal of drugs.

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