



## KNOWLEDGE AND AWARENESS OF THE MEDICINE DISPOSAL AMONG HEALTHCARE PROFESSIONALS

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### ABSTRACT

Pharmaceutical active preparations are designed with specific biological and physiological properties. These formulations possess desired therapeutic action against numerous diseases and infections. But some preparations have hazardous effects on the environment when it comes to disposal of medicines, it is necessary to know about the importance of proper waste disposal. The primary objective of the study is to know about the importance of the medicinal waste disposal system and the awareness among health care professionals especially past expiry date. The cross-sectional survey-based study was performed in Karachi. Data was collected through an online Google questionnaire form. The results were analyzed. Among 203 responders, 65% (n=132) were females while the other 35% (n=71) were males. Approximately 57.1% (n=116) agreed that they are aware of the hazards and disposal of medication waste and 63.05% (n=128) think that it is the responsibility of Pharmacies Association and other regulatory bodies for awareness of proper disposal of medicines. The study recommends that we establish uniform guidelines for the safe disposal of expired or unused medications. Significant problems and malpractices were identified for unused, and unwanted prescription medication, lack of a drug take-back system, proper disposal of medications & surgical, inadequate awareness about disposal system adversely affecting our environment and health.

**Keywords:** Disposal, Medication, Unwanted prescription, Awareness

### INTRODUCTION

Pharmaceuticals possess specific physiochemical and biophysiological properties to achieve desired therapeutic effects for various diseases. All formulations have a shelf life, after which the drug either

loses its effectiveness or breaks down into harmful chemicals [1]. If not disposed of properly, the resulting decomposition products are not only hazardous to health but also harmful to the environment [2]. To avoid this disease, drug therapy is the most



available method to improve physical and mental health. Medical health has played a very important role in improving quality of life for centuries [3]. According to the World Health Organization, more than half of medicines are improperly formulated and marketed, leading to unnecessary storage and environmental hazards [4]. Medicines can enter the environment through human and animal waste, and unused medicines which are discarded improperly [5]. Analgesics, antiepileptics, beta-blockers and antidepressants have been identified at 30 sites in Sydney Harbor [6]. In addition, the pharmacological groups mentioned above and others such as lipid-lowering drugs, and estrogens, have been identified on land and in the sea worldwide [7]. The most common sources of environmental pollution from pharmaceuticals are household [8] industrial waste, hospital effluents and wastewater, and human excreta [9]. In addition, pharmaceuticals have been found at low concentrations in surface-treated water, groundwater, and drinking water [10]. Despite low concentrations in the environment, these pharmaceuticals have effects on human health and the aquatic environment [11]. With the consumption of pharmaceuticals increasing day by day, we need to know the importance of properly disposing of this medical waste. Most pharmaceuticals are dumped into water systems and land areas, and like these chemicals, they require a high degree of caution from the pharmaceutical industry. The U.S. Food and Drug Administration has

outlined several options and guidelines to consider when returning drugs for drug disposal (removing unused and expired drugs returned to public pharmacies or collection points). programs designed to increase safe drug disposal and reduce drug waste by disposal in household waste and/or toilet flushing. When no collection or return programs are available, most unused, or expired medications are often discarded mixed with active ingredients such as dirt, kitten litter, and used coffee grounds. Then put it in a sealable bag and throw it in the trash [12]. The exception is medicines that contain controlled substances and should not be thrown in the trash. Self-medication is also part of human nature and means taking the medication without a prescription or doctor's advice. The most commonly available over-the-counter drugs are pain relievers, cough syrups, and some well-known antibiotics [3]. Taking medications on the advice of relatives or friends without consulting a healthcare professional, sharing medications with family members, or taking leftover medications ” [13]. Pharmaceutical waste is now flowing down the drain, terrifying environmental scientists around the world. By using proper disposal methods, you can prevent the release of hazardous materials into the environment. All medicines must be disposed of, except hospitals, drug warehouses, private hospitals, and household medical waste. There are many things to consider when disposing of unwanted medication (your hospital, local pharmacist, or organization



with a healthcare program will decide when to act). Allowing the disposal of medicines requires planning, funding of the necessary knowledge, worker safety and health, and sorting medicines into different categories by disposal method. Controlled substances such as narcotics and psychotropics, require tight security and have different disposal options [14]. The World Health Organization defines reasonable use of medicines (RUM) as “This puts drug users at the forefront and places a huge responsibility on many people and institutions”. In the meantime, various hurdles must be overcome to properly dispose of unused/unnecessary medicines. For example, many countries do not have laws or systems in place to properly dispose of drug waste [8].

#### **MATERIAL AND METHODS**

A cross-sectional survey of 203 participants completed the study by properly answering the designed questionnaire. Conveniently selected from different areas of Karachi. The eligibility criteria were pharmacists, pharmacy technician or other health care professionals, aged  $\geq 20$  years. An online google questionnaire form was distributed during February 2022, *via* e-mail and social networks; that google form was designed by the students of the Faculty of Pharmacy, Hamdard University. The study protocol and questionnaire were ethically approved by the Ethical Committee with reference no. ERC-FoP-2022-002. However verbal consent was also received from every respondent after explaining the purpose of the examination

and that verbal knowledge.

The framework of this study is divided into two sections: The first section of the study was about the demographic data like (Name, gender, age, and department, Position/level, Organization, Family Income, Years of Experience, and Field) as presented in **Table 1**.

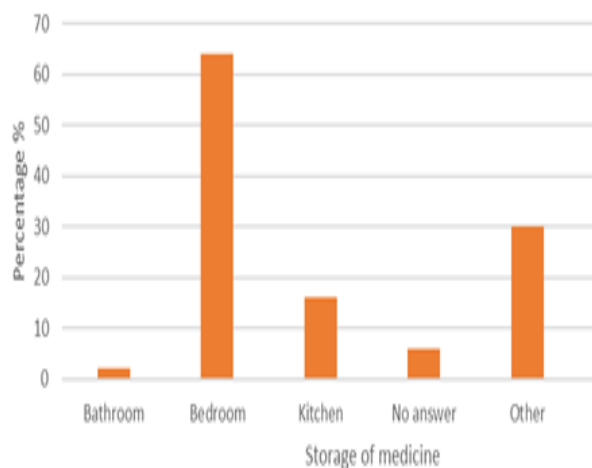
The second section consisted of close-ended questions like how much they knew about the proper way of drug disposal, how to discard a waste medicine and either they used medicine beyond expiry date etc., these questions were easier to respond and exclude inappropriate responses. The information was then analyzed using descriptive analysis.

#### **RESULTS**

In the present study number of females exceed males as shown in **Table-1**. Among the respondents 65% (n= 132) were females while 35% males (n=71) with a majority belonging to age group 18-24 years (68.1%) while only (2.9%) belonged to age group 51 and above. Majority of respondents were medical students (54.9%) while Pharmacist (34.8%), Lecturer (5.4%), Head of department (3.3%), Chief medical officer, Consultants and RMO (0.5%) belonging to private organizations (92.2%) having no or less than a year experience (19.4%).

Regarding knowledge about disposal of medicines, 95.5% (n=196) believed that improper disposal of medicines does affect environment and health and 91.6% (n=186) population, before procuring the medicine do check the expiry date. 69.7% (n=140)

respondents responded that they do collect all the medications that were prescribed the first time even if they don't need some of them and 71.9% (n= 146) do have leftover unused or unwanted medications in their house. While, a smaller number of populations, 24.4% (n=49), have followed drug-take back system as shown in **Table 2**. While assessing the practice towards drug disposal, most of the population, 61.2% (n= 123), responded that they do not collect all of the prescription repeats. As represented in **Table 3** and **Figure 1**, most of the population store the medicines in the bedroom, 53% (n=107), while only 2.5% (n=5), store them in the bathroom. The possible reasons observed for not using all the medicines were unsurety regarding the medicine prescription 48.3% (n=98) and improvement of the medical condition 44.3% (n=90). While antibiotics were reported as the most trending medicine 41.1% (n=78).



**Figure 1: Practice of storage of medicines at various households.**

In figure 1, the result findings elaborate on the awareness about the storage of medicines, and we found that majority of the healthcare professionals store medicines in their rooms to assure the safety of medicines from an unhygienic environment. The graph depicts the percentage of medicines for daily use or expired are stored in various locations and mostly people store them in their bedrooms for easy access.

The degree of awareness among the respondents was evaluated and positive findings were observed regarding the knowledge of drug waste as majority of the respondents 57.1% (n=116) were aware about it and 68.8% (n=139) considered electronic media as the best source for awareness in the society while 62.4% (n=128) believed Pakistan Pharmacy Association to be responsible for creating awareness about proper drug disposal. Whereas, a smaller number of populations, 33.2% (n=67), is aware about the drug take-back system **Table 4**.

Due to the lack of awareness and proper guidance, improper drug disposal practice has led to serious health and environmental hazards. Therefore, creating awareness and promoting proper drug disposal methods especially among health care providers is of utmost importance. This study was carried out for the purpose of determining knowledge and awareness of proper drug disposal methods among healthcare providers [9].



**Table 1: Sociodemographic characteristics of Participants.**

Categories		Response (N)	Population (%)
Gender	a) Female	132	65%
	b) Male	71	35%
Age	a) 20-24 yrs.	139	68.47%
	b) 25-30 yrs.	47	23%
	c) 31-35 yrs.	3	1.5%
	d) 36-40 yrs.	7	3.4%
	e) 41-50 yrs.	2	1%
	f) 51 and above	5	2.5%
Position Level	a) consultant / surgeon	1	0.5%
	b) chief medical officer	1	0.5%
	c) Head of department	7	3.3%
	d) RMO	1	0.5%
	e) Professor	0	0%
	f) Lecturer	11	5.4%
	g) Pharmacist	70	34.8%
	h) medical student	111	54.9%
Organization:	a) private	183	90.14%
	b) government	20	9.85%
Year Of Experience	a) 5-10 yrs.	17	8.9%
	b) 10-15 yrs.	3	1.6%
	c) 15-20 yrs.	2	1%
	d) 20 and above	2	1%
	e) no exp less than a year experience	37	19.4%
	f) 1-5 yrs.	28	14.7%

**Table 2: Knowledge toward Disposal of Medicines**

Questions	Response N (%)	
Improper disposal of medicines, affect environment and health?	Yes	196(95.5%)
	No	9 (4.4%)
Have you any leftover unused or unwanted medications in your house?	Yes	146
	No	(71.9%) 57 (28.1%)
When you get a first prescription from a doctor, do you collect all the medications that were prescribed the first time even if you decide that you do not need some of them?	Yes	140
	No	(69.7%) 61 (30.3%)



Do you check expiry date of the medicines before procuring	Yes	186
	No	(91.6%) 17 (8.4%)
Do you have any leftover unused or unwanted prescription medications in your house at present?	Yes	146
	No	(71.9%) 57 (28.1%)
Have you ever followed drug-take back system?	Yes	49 (24.4%)
	No	152 (75.6%)
Do you check expiry date of the medicines before procuring	Yes	186
	No	(91.6%) 17 (8.4%)

**Table 3: Practice toward drug disposal.**

Questions	Category	Response N (%)
Collect all of the prescription repeats even if you decide that you do not need /want them	Yes	78 (38.8%)
	No	123 (61.2%)
Trend of medicines according to research study	Antidepressant	30 (15.5%)
	Hormonal Treatment	12 (6.3%)
	Lipid Regulators	06 (3.2%)
	Anti-epileptic	04 (2.1%)
	Antihistamine/Anti-Allergy	10 (5.3%)
	Anti-Diabetic	13 (6.8%)
	NSAIDs	25 (13.2%)
	Antibiotics	78 (41.1%)
Different reasons why people do not use all of their medications.	Anti-Hypertensive	12 (6.3%)
	Change To Another Treatment	85 (41.9%)
	Excess Quantity Supplied	57 (26.6%)
	Inconvenience/Difficulty Following Instructions	31 (15.3%)
	Unclear Instructions	29 (14.3%)
	Unsure Why Prescribed	38 (18.7%)
	Medical Condition Improved Or Resolved	90 (44.3%)



	Patient Deceased	23 (11.3%)
	Passed Expiry Date	12 (5.9%)
	Side-Effects Of Medication	41 (20.2%)
where do you usually store your medications?	Bathroom	05 (2.5%)
	Bedroom	107 (53%)
	Kitchen	35 (17.3%)
	No answer	10 (5%)
	Burn	00 (0%)
	Other	45 (22.3%)

**Table 4: Awareness level among participants.**

Questions	Category	Number (Percentage) N (%)
Do you know about medication waste?	Yes	116 (57.1%)
	No	87 (42.9%)
What would be the best source of awareness for society?	newspaper	21 (10.4%)
	electronic media	139 (68.8%)
	pharmacy	35 (17.3%)
	physician	07 (3.5%)
Do you know about drug-take back system?	Yes	67 (33.2%)
	No	135 (66.8%)
who is responsible to create awareness for proper disposal of medicines?	Government	44 (22.4%)
	Industries	22 (10.4%)
	Public	09 (4.4%)
	Pakistan Pharmacy Association (PPA)	128 (62.4%)

Approximately 69.7% respondents reported that they do collect all the medications that were prescribed to them even if they don't need some of them and (71.9%) respondents reported that they do have leftover/unused medications at home as shown in **Table 2**. When medicines are kept unused for a longer period of time, they often get expired or may lead to self-medication [10]. Unused medications are being kept in case they are

needed later (60.9%) while the major reason for not using all the medications reported was side effects of medication (48.3%).

Though, it was found from some studies that storing leftover or unused medicine for an extended period can have hazardous effects due to incidental consumption. Irrational medicines use practice are predisposed by undesirable habit, including drug waste, incorrect treatment, antibiotic resistance,



pharmaceutical errors, and intoxication, drug usage of insufficient length and dose, and unnecessary self-medication [5].

## DISCUSSION

Concerning the damaging consequences and potential risks by the use of expired drugs, respondents were asked whether they check expiry date of medicines before purchasing [15]. From the results, it was observed that a major number of respondents (91.6%) are aware of the importance of checking the expiration date of medicines and the harmful effects that it could lead [16] as shown in **Table 2**. These findings significantly outperforms those of a study conducted in Riyadh, Saudi Arabia regarding the Prevalence and Practice of Unused and Expired Medicine which reported that (55.2%) respondents checked the expiry date of the medicine prior to actually purchasing it, while 5.6 percent were unaware of it [17]. To prevent waste and to maintain the stability and efficacy of medicines proper storage is an important factor. Keeping medicines in the bathroom or kitchen is an inappropriate way of storing them that could lead to hazardous effects [18]. It was reported in our study that most of the respondents (53%) store medicines in the bedroom as shown in **Table 3 and Figure 1**. Due to the lack of knowledge of proper drug disposal methods, majority of the population reported that they dispose liquid medications down the sink (n=67) ; tablets/capsules in the rubbish (n=64); ointments/creams in the rubbish (n=65).It was also observed that larger proportion of participants are unaware

of the proper disposal system for medicines, as few return medicines to pharmacies or donate to welfare or hospitals [19].

When asked, participants approximately (57.1%) reported that they know about medication waste as shown in **Table 4**. Furthermore, a positive response was obtained and (95.5%) of population reported that improper disposal of medicines can affect the environment and health similar result obtained in Liberia (82.1%) [20] where the appropriate way to control and minimize the hazardous effects of unused or expired medicines is to provide proper guidance to the consumer (38%) and create proper awareness for society through electronic media (68.8%). Pakistan Pharmacy Association was reported to be responsible to create awareness for proper disposal of medicines (62.4%).

According to the results, allopathic therapy is the most common therapy (n=160); homeopathic being used sometimes(n=121); herbal being the rarest therapy (n=101) while antibiotics were being reported to be the most trending medicines (41.1%) as shown in **Table 3**.

According to the result, majority of the respondents, (66.8%), were unaware about drug take back system and only (24.4%) follows this system as shown in **Table 4** while in Malaysia, a large proportion of the respondents did not know about drug-take-back system (n=828), and only a small proportion of the respondents were aware of it (n=57) [9].

It has been concluded that there is lack of





knowledge and insufficient awareness regarding proper drug disposal methods as a large proportion of the participants were not aware about drug take back system and very few return them back to pharmacies or donate them to a hospital or welfare, but it was also observed that there is proper awareness among the participants about the hazardous effect of improper medicine disposal. Hence, this is a quite alarming situation for the policy makers to create proper guidelines about appropriate drug disposal methods or else it could lead to promotion of off-label use and side effects of medicines. Proper pharmacy takes back programs and awareness sessions should be launched to raise awareness and consequently save the environment.

### **CONCLUSION**

This study was conducted to assess the knowledge and practices of drug users regarding how to dispose of unused or expired drugs and to explore the following information: How people dispose of unused medicines, why people don't take all their medicines, and what can be done to reduce the side effects of unused medicines. According to the survey, most people discard medicines improperly and are unaware of the consequences of improper medicine disposal. The survey found that most of the participants left a lot of unused or expired medicines at home, indicating a lack of awareness among drug users about safe disposal of medicines. To minimize the inappropriate disposal of medicines, the government will establish a national-level

drug recall program that prioritizes the collection of returned unused or expired medicines at all levels of presidential hospitals. is needed. Awareness programs should be conducted regularly for all or some health professionals to educate, advise and motivate the public about the safe disposal of medicines. Media such as television and social networks should be used to disseminate information about the environmental issue of improper drug disposal. Proper education about drug disposal is important. Raising household awareness of the ill effects of accidental drug exposure and improper disposal paves the way for competent authorities to take the initiative to enforce regulation.

Most participants were familiar about the need for safe disposal of unused medicines. But the right attitude for and practice of safe disposal of medicines is lacking. The aim of this study was to assess the disposal practice of expired and unused medication and increased awareness regarding safe disposal of medicines to avoid the potential risk of contamination of our environment.

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