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Management of pharmaceutical waste in the Babylon Governorate

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Abstract

Globally, a massive amount of expired or leftover medications accumulates each year because of pharmaceutical overprescription, combined with overproduction. This pharmaceutical waste poses environmental, economic, and social/ethical challenges. The objective of this study is to understand societal behavior regarding the disposal of medications in the Babylon Governorate and develop a prototype of a knowledge-based system that promotes proper disposal of pharmaceutical waste. A two-phase cross-sectional study was carried out. The first phase involved interviewing pharmacists, while the second phase targeted the general population. A visit to Aljiumhori Hospital was made in order to assess the pharmaceutical waste disposal methods. The study found that most pharmacists (70%) and people (59.2%) prefer throwing expired medicine in the trash can. Moreover, 64.4% of the people participating in our study believe that placing unused drugs in special containers in each region is the best disposal method. Additionally, 48.2% of households are unaware of the environmental and health consequences of this waste. Pharmaceutical waste disposal in the Babylon Governorate is poorly managed. The absence of processes separating medical waste from general waste and the use of sanitary landfills as the sole method of disposal can pose serious environmental and public health risks. One can only address this issue with proper waste management, staff training, and protocol adherence.

KEYWORDS
waste management, pharmaceutical waste, disposal, public health, pharmacist

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1. INTRODUCTION

Pharmaceuticals are essential for human health, and their use continues to grow each year as new drugs are introduced into the market alongside existing products. This increasing volume of pharmaceutical usage raises concerns about its potential negative impact on healthcare workers, society, and public health. Research on the presence of pharmaceuticals in water has attracted significant attention over the past decade [1,2]. Pharmaceutical waste includes medications that have expired, have been unused (rejected by the patient), have been spilled, have become contaminated, or that are simply no longer needed. This category also includes prescribed and proprietary drugs, vaccines, and sera that require careful disposal due to their chemical or biological properties [3]. The way

pharmaceutical waste affects the environment depends on its toxicity, mobility, bioaccumulation, and persistence. Persistence includes factors such as transformation products, metabolites, solubility, and half-life. The adverse effects of toxicity can be seen at an individual level, in populations, or as a result of mixtures and additive effects. Pharmaceutical waste can end up in rivers, oceans, groundwater, soil, lakes, and sediments [4]. The main contributors of pharmaceutical chemicals in sewer systems are households and hospitals. Health facilities often dispose of items such as IV bags and syringes down the drain, while pharmaceutical waste discarded in landfills can leach into sewer systems and groundwater [5].

Various methods for the safe disposal of pharmaceuticals are outlined by the World Health Organization, focusing on the minimizing of risks to public health and the environment. These methods are suitable for countries with limited resources and equipment. If Ministries of Health, Environment, and other relevant authorities adopt and implement these guidelines, it will lead to a safe and cost-effective elimination of stockpiles of unusable pharmaceuticals. High-temperature incineration with proper flue gas cleaning is considered the most environmentally sound method for pharmaceutical destruction. However, many countries lack the infrastructure for this type of facility. As a result, these guidelines offer practical interim alternatives to aid those responsible for the safe disposal of unused pharmaceuticals. While the current guidelines suggest slightly less safe treatments and disposal methods, they are still acceptable when compared to the risks associated with improper or non-disposal. It's important to note that disposal options can differ widely depending on the circumstances, and the best solution may not always be feasible [6]. The global management of pharmaceutical waste has become a significant challenge due to the lack of take-back programs in many countries, leading to unsafe disposal practices. Additionally, public unawareness and improper use of medications by patients are major contributors to the accumulation of pharmaceutical waste [7]. Pharmacists, as trusted and accessible drug information resources, are well aware of the limited value of many medications. They should take on the responsibility of transforming the entire medication use process, seeking solutions, and minimizing the environmental impact of pharmaceuticals. Pharmacists are involved in every stage of the medication process, including prescribing, advising, dispensing, providing pharmaceutical care, and disposing of expired medicines, with the ultimate goal of reducing the discharge of metabolic waste into the environment. Therefore, pharmacists should identify and address any excessive or unnecessary prescribing so as to minimize leftover medications that may be improperly disposed of. They should also encourage and monitor patient adherence to ensure that all prescribed medications are used appropriately [8]. Pharmacists have a responsibility to prevent the disposal of pharmaceuticals through open dumpsites, burning, or insecure landfills, as these practices pose a significant risk to public health. They should educate relevant authorities about the financial implications of proper disposal, the various available options for disposal, and the potential for outsourcing disposal services [9]. Finally, pharmacists need to be well-informed about local drug disposal initiatives so as to educate the public, and contribute to minimizing the impact of pharmaceutical waste on the environment and well-being [10].

2. MATERIALS AND METHODS

This study aims to assess the pharmaceutical waste management in the Babylon Governorate, serving as a model for Iraq. It focuses on waste isolation, disposal methods, and environmental challenges faced by healthcare institutions. The study also aims to identify sustainable practices and innovative waste treatment technologies, and to promote awareness among healthcare professionals, consumers, and policymakers. To achieve this, a two-survey study was conducted. The first survey targeted the general public in order to assess their awareness of the risks associated with these types of waste and of the most common methods used to dispose of them. A total of 233 people participated in this questionnaire, with the majority completing it electronically, while some filled it out on paper. The second survey targeted pharmacists by assessing their awareness and determining the fate of expired and surplus medications in pharmacies. A total of 50 pharmacists participated in filling out the paper questionnaire. A visit to the Aljiumhori Hospital was also carried out in order to assess the hospital's pharmaceutical waste disposal methods.

3. RESULTS

The most common disposal method of expired medicines among pharmacists (70%) and the general population (59.2%) was to simply use a trash can. About 20.3% of the general population did not know that pharmaceutical waste disposal should be managed, while 44.8% knew it should be managed but were unaware of how to do it. We found that 44% of the pharmacists attributed the respon-

sibility of raising awareness about proper disposal of pharmaceutical waste to the Ministry of Health. Less than half (41%) of the general population's respondents did not have adequate information about the harmful effects of this waste on the environment. Most respondents (59%) of the general population kept the unused medication at their homes. The majority of pharmacists (92%) check the expiry date of the medicine before purchasing it. However, 74% of the pharmacists reported that some quantities of purchased medicine remains unused in the pharmacy. The study found that the Aljiumhori Hospital does not separate pharmaceutical waste from regular waste, leading to its disposal in landfills. Table 1 provides a detailed account of the general population's behavior, awareness, and attitude toward pharmaceutical waste.

Table 1. Synopsis of the respondents' knowledge of pharmaceutical waste management in the Babylon Governorate.

General Population Questionnaire					
Age (in years)					
18–25	26–30	31–39	40–49	50–59	>60
68%	11%	8%	3%	5%	5%
Sex					
Male			Female		
37%			63%		
Job					
Student	Employee		Housewife		Earner
55%	29%		5%		11%
Storage of medications					
Specific Space/ Home Pharmacy		Several Places		In Kitchen Cabinet	
54%		36%		10%	
Do you keep expired medications?					
Yes			No		
93%			7%		
Do you have medications that you no longer use?					
Yes			No		
59%			41%		
Do you have information that this medication should be disposed of?					
I know and I know how to manage it		I know, but I do not know how to manage it		I do not know at all	
35%		45%		20%	
How do you dispose of unused drugs?						
Throw them in the garbage	Throw them in the toilet or sink	Burn them	Return to pharmacy	Give it to a friend/ other people	keep them in-house to use when needed	Special containers in our region
59.2%	4.7%	4.3%	7.3%	2.6%	36.9%	1.7%
Does the pharmaceuticals unit in your region collect expired / unused medications?						
Yes			No			
83%			17%			
How well-informed do you consider you are about the hazards that these wastes represent?						
Pretty informed		Little informed		Not at all informed		
58%		41%		1%		
In your opinion, what is the most appropriate method to dispose of unused drugs?						
Do not know	Throw them in the garbage	Keep them in-house to use when needed	Burn them	Return them to the pharmacy	Use special containers in your region	
2.5%	2.4%	1.6%	7.7%	27%	64.4%	

4. DISCUSSION

Improper disposal of pharmaceutical waste can have several detrimental effects; therefore, waste management should be thoroughly planned, implemented, and maintained. Our study shows that the Babylon Governorate's population has inadequate information regarding the disposal of pharmaceutical waste. Improvement is required in both the knowledge and the practice of disposal of unused and expired medications. As a result, there is a need for information campaigns aiming to educate the population about the secure disposal of pharmaceutical waste. Unsurprisingly, 82.8% of the population reported that their local pharmaceutical unit does not collect expired or unused medications from citizens. The complex procedures, the lack of time, the absence of a legislation for collection, and high costs are the primary reasons for which some pharmacists decline to accept unused drugs from the population. Implementing special containers in pharmacies for the collection of pharmaceutical wastes is advisable, as 64.4% of the people who participated in our study believe that placing unused drugs in special containers in each region is the best disposal method. Furthermore, it is crucial to incorporate this crucial topic into the pharmacy syllabus, thereby taking a practical approach that reflects the current demand. Pharmacists (68%) in our study agreed that "drug take-back" programs should be mandatory. Returning leftover and expired medicine through such programs is the safest and most environmentally sound disposal method. Whenever possible, it is preferable to return the medicine to the manufacturer, as they are likely to have effective disposal methods in place.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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