Pharmacists' Role in Reducing Pharmaceutical Waste

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ABSTRACT

The disposal of leftover/unused medicines is an area of concern in several countries as their improper disposal can impact the environment, which in turn, will affect the health of humans and animals. The main objective of this study is to know the opinion of pharmacists related to the disposal methodologies of unused medications. Several pharmacists were studied in Northern India to evaluate the opinion and the practice towards safe disposal of unused/unwanted medicines. Random interview studies were carried out in North India using a questionnaire. The questionnaire was based on reason, i.e., unused medicine disposal practices opinion of pharmacist as appropriateness of the disposal methodology and awareness of hazard effects of improper disposal. The data was collected from various categories of individuals and interpreted. A total of 135 registered pharmacists participated in this study. The main method that was adopted by the respondents was to dispose the unwanted medications in trash and flush down the sink, which accounted for nearly 42% and 11% of the respondents, and 6% were in the practice of burning/throwing in household waste. Fifty-three percent agreed that they were not aware of the environmental hazards due to this practice and 11% said community take-back programs could help to solve the problem. About 30% of the pharmacists accepted that their pharmacy has collecting point of unwanted medicines. Regulatory authorities should implement and execute policies for proper and safe disposal of unused medicines.

Keywords: Unwanted medications, unused medications, disposal of unused medicines, expired medicines, pharmaceutical waste

The disposal of unused/unwanted medicines from household and healthcare sector is becoming an emerging problem for local and national health and environmental departments. The concerns regarding inappropriate medicine disposal by throwing them in dustbin, flushing down the sink and disposing without proper precautions have been growing and now they are receiving attention.[1] Expired, unused, damaged and contaminated substances from households and healthcare activities all come under the category of unwanted medicines. So, it is not uncommon to find them, but whenever such situations arise, there should be clear guidance and methods on how to dispose them.

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There have been several ways, such as educational materials and regulations, which are available for the same, but the extent to which they are implemented is not clear.[2] Not just one, but many problems have been encountered regarding improper disposal of medicines. Some of them are not just limited to humans but animals also.

Keeping unused medicines at home may end up in accidental poisoning in children.[3] Pharmaceuticals have a chance of entering drinking water as well and they may affect populations like pregnant women, which emphasizes the need for awareness and practices for safe disposal.[4]

The fate of the improperly disposed medicines in water is unknown because unfortunately, current water treatment systems do not remove many pharmaceuticals from drinking water.[5] Usually the concentration of these medications is negligible; however, long-term exposure to even low levels of multiple medications could be hazardous.[6-8]

If medicine disposal is improper, the health of the exposed population is at risk. The drains often percolate to the soil, which in turn, contaminates the mass of

land and it passes to the food chain. Ineffective treatment of wastewater pollutes freshwater, thus polluting the environment.[9] Many types of chemicals were found in 80% sampling of 139 streams of US and the most common were detergents, hormones, prescription/nonprescription drugs, pesticides and antibiotics.[10] Some pharmaceuticals have been found in cow, goat and human milk.[11]

It is a common myth that the expired or unused medicines may be resupplied/repacked by changing their expiry period. While there is no evidence, many people continue to have this opinion.

To cope up with the current market, the increase in manufacturing of pharmaceuticals has led to increase in pharmaceutical waste. The recommendation comes from the World Health Organization (WHO) that unusable medicines should be considered as a pharmaceutical waste, which need to be disposed appropriately, as unsafe disposal of these unwanted or expired drugs often creates a major problem.[12] Some medicines should be crushed and mixed with cat litter or coffee grounds and disposed in trash in a leak proof sealed container, which will eventually decrease the chances of poisoning.[13-15]

However, several other safer methods are also used, such as reverse distribution and drug take-back programs, in which unused/left out medicines are collected by nearby local pharmacies or government/private agencies. In many countries, it has been found to be the best method. The main aim of this medicine collection program is to avoid the unwanted medicine pollution, thus reducing the amount of drugs available for accidental poisoning or theft. Further, such programs provide full support to the public to return unwanted medicines so that they can be disposed of safely.[16] Medicines take-back programs that collect medicines from a central location for safe disposal are the most environmentally safe disposal method.[17]

Considering the fact that pharmacists can have a role in safe disposal of medicines, we conducted a study among pharmacists to determine their awareness, behavior, opinion and practice towards safe disposal of unwanted medicines.

METHODOLOGY

North India (mainly Delhi and NCR) was selected for the study. Pharmacists were selected at random and the study was conducted from July to November 2019. All the selected pharmacists were visited with a questionnaire.

The questionnaire was prepared in English language. Before the survey was conducted, its purpose was well informed to the participants and they were assured that their information would remain confidential, and that only the researchers would have access to the information. For the conclusion and completion of the study, few points were taken care of:

- Socio-demographic characteristic of the respondent (male/female), including their age, marital status, educational qualification (Table 1).
- Reason mentioned for having unused medicine with consumers including subsiding condition, carelessness, forgetfulness, excess purchase, intolerable side effects, treatment changed, unpleasant taste, expiry date.
- Unused medicine disposal practices, including throwing them in waste bins, flushing into toilet, burning, return to pharmacy, buried in ground, given to needy persons.

By using appropriate statistics, the collected data was analyzed.

RESULTS

A total of 135 government and private pharmacists participated in the study and had work experience of 10 to 30 years. Male participants were more than female participants.

Table 1. Socio-demographic Data

Demographic Data	Variables	No. of participants	Percentage (%)
Gender	Male	110	81.4
	Female	25	18.5
Qualification	Graduate in Pharmacy	45	33.3
	Diploma in Pharmacy	35	25.9
	Others	55	40.7
Age	25-30	42	31.1
	31-40	48	35.5
	41-50	45	33.3
Experience	Less than 10	37	27.4
	10-20	53	39.2
	21-30	45	33.3

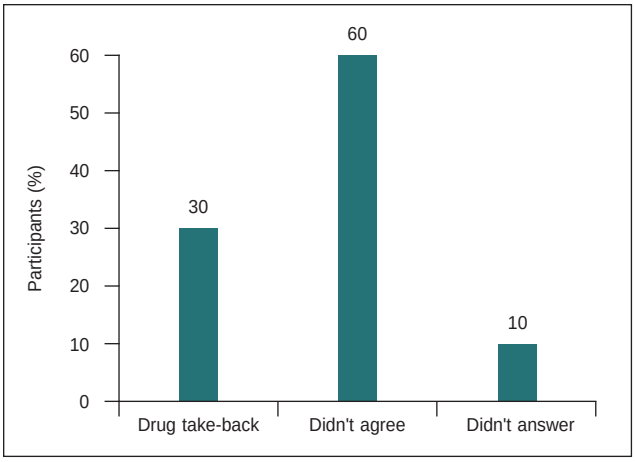

Figure 1. Participants' opinion on drug take-back.

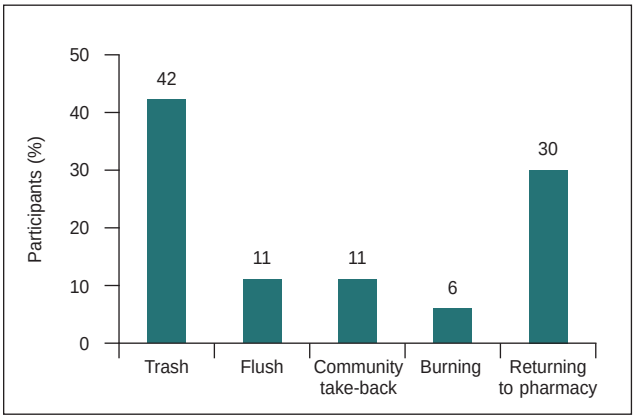

Figure 2. Participants' opinion and practice towards disposal of medicines.

Figure 1 represents the participants' opinion on drug take-back. About 30% of the respondents accepted take-back of unwanted medicines and agreed to keep their pharmacy as a drug take-back center while 60% of the respondents did not agree. About 10% didn't answer.

Figure 2 shows participant's opinion and practice towards disposal of medicines. Among these, 42% of the respondents stated that they were throwing the unwanted/left out medicines into trash, 11% were flushing it down the sink/toilet, 30% stated giving back to pharmacy was the best option, 11% said community take-back programs could help to solve the problem and 6% were following other methods like household waste or burning the unwanted pharmaceuticals.

Figure 3 represents the knowledge and awareness of safe disposal methods and hazards of improper disposal. Among the respondents, 53% stated that they were not aware of the consequences due to improper disposal of medicines on humans and environment, 45% were aware of the hazardous effects while 2% didn't answer.

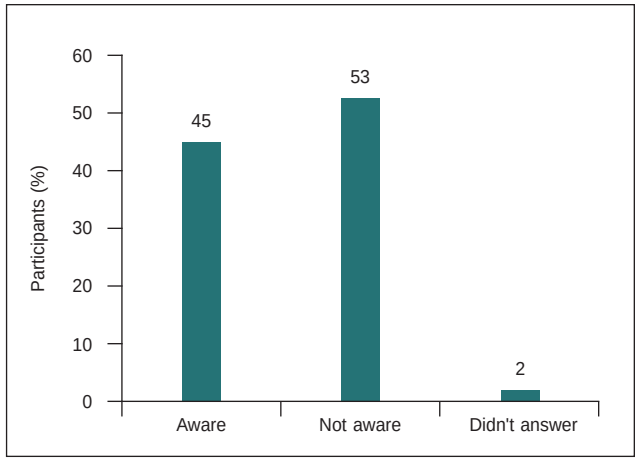

Figure 3. Participants' knowledge and awareness of safe disposal methods and hazards of improper disposal.

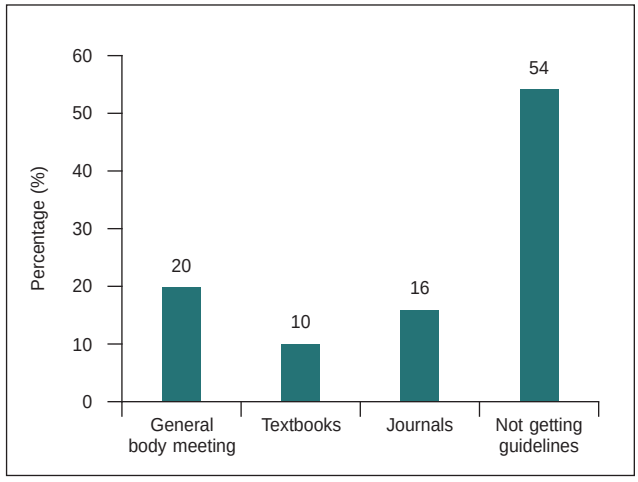

Figure 4. Receipt of instruction or guidelines for safe disposal.

Figure 4 represents receipt of instruction or guidelines for the safe disposal methods. Fifty-four percent of the participants said that they couldn't get any guidelines regarding the safe disposal procedures while 46% were getting guidelines for safe disposal from different sources, including 20% from general body meeting, 10% from textbooks and 16% from journals. It was also stated by the participants that national and local government agencies, social media, and drug manufacturing companies have to take a step forward in creating awareness and giving guidelines for environment friendly disposal methods. Most of the participants expressed that there is much less awareness of the issue.

DISCUSSION AND CONCLUSION

There is high occurrence of pharmaceutical and personal care products in drains, sewerages and rivers and they are signaled to be a future disaster. One of the

important effects due to presence of pharmaceuticals in environment is occurrence of antibiotic resistance.

Improper disposal of unused medication is a global problem, both in developed and developing countries. In developing countries, this is more problematic as it often leads to health risks and environmental hazards.

Although there are options for disposing medications, consumers keep the unused leftover as they don't want to let their money go waste, while they don't know the risk of keeping unused medication. The leftover medication at home possesses several risks, such as deterioration of potency, accidental overdose and consumption of expired medicine. Therefore, one has to dispose of these medicines timely, but the disposal shall be done keeping in view the community and environment.

A major hand behind safe disposal of medicines is that of medical professionals since they are directly in contact with the consumers. Pharmacists can influence safe disposal of medicines.

One of the best methods encountered for the safe disposal of unwanted medicines is the drug take-back programs; however, it is less popular, less practiced and leaves people with fewer options. Among the participants in the study, a pharmacist with years of experience said, "We are ready to accept the unused medicines from the patients if they come along with their payment slip and the prescription within couple of months of the purchase of the medicines. Another pharmacist with work experience of years said, "We give back the expired medicines within 3 months back to the distributor/manufacturer, in return we get credits from them, it's a kind of redistribution and an environmentally friendly habit by avoiding unsafe disposal of drugs, especially of antibiotics and cytotoxic drugs.

Usage of medicines from soon to expire stock and avoiding unnecessary prescribing are practices that may contribute to decreased medicinal waste.

This study provided the current scenario of knowledge and practice towards the disposal of medicines by pharmacists. The awareness regarding impact of improper disposal of pharmaceutical waste is still an issue, which needs immediate attention. The current practices are not optimal for collection and disposal for the pharmacist. Pharmacists have the potential to be on the forefront of this movement, but it is essential that their knowledge of proper medication disposal should be complete and accurate.

Teaching of proper disposal of pharmaceuticals in medical, dental, nursing, veterinary or pharmacy curriculum is needed. From this study, it can be said that there is an urgent need for raising awareness and education on medicines take-back program to avoid environmental pollution. There should be national guidelines on the appropriate disposal of unused and expired medicines to minimize the impact on environment and best ways to educate about proper disposal, which may be started through school, religious places, community meetings and at pharmacies.

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New Type 2 Diabetes Treatment Appears Promising in First Human Study

Patients with type 2 diabetes who were given daily treatment with sodium phenylbutyrate for 2 weeks were found to have significant improvements in peripheral insulin sensitivity and glucose oxidation, reported a single-center, randomized, double-blind, placebo-controlled, crossover study.

Patients received their glucose-lowering medications and 4.8 g/m^2/day sodium phenylbutyrate or placebo divided in three doses, for a duration of 2 weeks. This was followed by a 6- to 8-week washout period, and 2 weeks on the alternative treatment. Peripheral insulin sensitivity improved after 2 weeks on sodium phenylbutyrate by 27% in comparison with placebo ($p = 0.0155$). Sodium phenylbutyrate also improved carbohydrate-driven muscle mitochondrial oxidative capacity, whole-body insulin-stimulated carbohydrate oxidation and decreased plasma branched-chain fatty acid levels. The treatment was found to be safe. The findings suggest that targeting branched-chain amino acids may serve as a novel treatment strategy for patients with type 2 diabetes… (*Source: Medscape*)

FDA Clears Pembrolizumab for Adjuvant Treatment of Kidney Cancer

The US Food and Drug Administration (FDA) has granted approval to pembrolizumab for the adjuvant treatment of renal cell carcinoma (RCC) for those patients who have an intermediate-high or high risk of recurrence after nephrectomy, or after nephrectomy and metastatic lesion resection.

The approval has come after the KEYNOTE-564 trial showed that adjuvant treatment with pembrolizumab after nephrectomy led to a significant improvement in disease-free survival (DFS). About 22% of patients receiving immunotherapy had events of recurrence or death compared to 30% of patients in the placebo group (HR 0.68). This was a multicenter, randomized, double-blind, placebo-controlled trial that included 994 patients with intermediate-high or high risk of RCC recurrence, or stage M1 with no disease evidence… (*Source: Medpage Today*)

COVID-19 Booster Shots Increase Protection among Cancer Patients

According to a new study published in *Cancer Cell*, booster shots of COVID-19 vaccines evoked immune responses in cancer patients who did not have any detectable antibodies after the primary vaccination.

It was noted that in seronegative patients, a third vaccine dose led to a seroconversion rate of 56%. Investigators evaluated the anti-COVID immunity before and after a booster dose in 88 patients with cancer (31 with solid tumors and 57 with hematologic malignancies). About 73% of these were on active treatment at the time of receiving a booster shot. Nearly 64% of the patients were seropositive before the booster shot, while 36% were seronegative and all seronegative patients, except one, had hematologic malignancies. Four weeks following the booster jab, 70 of the 88 patients (80%) were found to have antibody levels higher than the levels prior to receiving the booster… (*Source: Medpage Today*)