

Original Research Article

A study on awareness regarding disposal of unused medicines among consumers at a tertiary care teaching hospital of North India

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ABSTRACT

Background: In the recent years, large number of human pharmaceuticals have been introduced to the environment by landfill when household medications are thrown to trash and liquid medications gain access to the environment via liquid drainage systems. There is lack of knowledge and awareness in the general public regarding the safe disposal of unused and expired medicines. The objective was to assess the awareness regarding disposal of unused medicines among consumers at a tertiary care teaching hospital of north India

Methods: It was a cross-sectional observational questionnaire-based study carried out on 220 consumers in medicine outpatient department (OPD) of a tertiary care teaching hospital in North India for 3 months. All the participants were provided the pre-validated self-administered questionnaire. The final questionnaire consisted of twelve questions to assess participants' knowledge and attitude towards disposal of the medicines. The data was analyzed with the help of descriptive statistics.

Results: It is quite evident from the present study that majority of participants 56.36% stated 1-5 drugs were left-over drugs at their homes. Most of the leftover medicines were analgesics in 59.1% followed by antibiotics in 51.36%. Most common dosage form of these leftover medicines were tablets in 85.9% of respondents. Majority of the respondents (55.9%) were not aware of the adverse outcomes of the pharmaceuticals in the environment. The most common method followed by majority of the participants for disposing of the solid, semi-solid and liquid dosage forms was garbage in 95%, 91.4% and 76.4% of consumers respectively. About 9.31% of the participants were in favour of initiating a program to collect unused medications from home.

Conclusions: It can be concluded from the present study that the consumers had poor knowledge regarding the safe drug disposal techniques. Therefore, efforts need to be done by the health care professionals to make people educate regarding the safe drug disposal techniques.

Keywords: Consumers, Drug disposal, Ecopharmacovigilance, Unused medicines.

INTRODUCTION

In the modern era, with the improved methods of development of new medications more and more of efficacious and safe medicines have been marketed for the treatment of diverse diseased states.¹ At the same time, the risk of contamination of environment with the

increased usage of medicines in humans as well as in veterinarians has been increased manifold.² Most of the active pharmaceutical ingredients (APIs) are polar compounds. Such APIs are generally found in mg or ng range in aquatic environment and thus are oftenly called as "micropollutants".³ It has been observed that proper knowledge regarding disposal of unused, unwanted and

expired medications is lacking in the general population.⁴ Ecopharmacovigilance is an important area in this context. It is defined as “The science and activities associated with the detection, evaluation, understanding and prevention of adverse effects of pharmaceuticals in the environment.”⁵ In the recent years, large number of human pharmaceuticals have been detected in the surface water.

Many a times, solid pharmaceuticals can be introduced to the environment by landfill when household medications are thrown to trash and liquid medications gain access to the environment via liquid drainage systems.⁶

These medications have been observed to affect the other animal species also. For example, population of vultures has been declined substantially in the last few years due to unintended exposure to diclofenac.⁷ Similarly, sterility in frogs has been noted in a study from Sweden due to the early exposure to progesterone.⁸ Even the feminization and demasculization of male fish are attributed to estrogens which are formed as by-products in industries.⁹

Moreover, improper disposal of medications have several other consequences also such as childhood poisoning, environmental pollution and antibiotic resistance.¹⁰ Medication wastage is considered a universal problem and has a significant impact on the cost of healthcare.¹¹ Various factors contribute to non-usage and disposal of medicines by consumers such as change of prescription by prescribers, adverse effects of the drug, unclear instruction, resolution of condition/clinical symptom and medicines reaching the expiry date.¹²

It is quite evident from the previously published literature that patients usually receive instructions on how to use and store medications but rarely do they get proper information on the safe and appropriate ways to dispose of such medications unless they ask the healthcare providers.¹³ There are specific guidelines formulated by National Formulary of India, 2011 which specifies the disposal of unused medicines.¹⁴

As it is unlikely to completely eliminate medication waste, establishing a safe and secure medication take back program to minimize unused and unwanted medications should be of high priority. Safe disposal of medicines is of utmost importance as malpractice may lead to harmful consequences.

Therefore, there is an urgent need to have newer techniques and methods to dispose of unused and unwanted medications.¹³ As there is lack of knowledge and awareness in the general public regarding the safe disposal of unused and expired medicines, therefore, in view of this the present study was done to assess the perceptions of general public regarding the safe disposal of unused medicines.

METHODS

It was a cross-sectional observational questionnaire-based study carried out in medicine outpatient department (OPD) of a tertiary care teaching hospital in north India for 3 months. The study was approved by Institutional ethical committee. The study was conducted on 220 consumers attending medicine OPD after obtaining their written informed consent. The purpose of the study was explained to the participants and their confidentiality was ensured. The consumers who were not willing to participate in the study or didn't provide written informed consent were excluded from the study.

All the participants were provided the pre-validated self-administered questionnaire. The questionnaire was pre-validated by doing a pilot study on 25 randomly selected participants. The questionnaire was developed in two languages-English and Hindi and participants could choose either version based on their preference.

The questionnaire was modified based on the results obtained from the pilot study and consisted of twelve questions to assess participants' knowledge and attitude towards disposal of the medicines. The data was analyzed with the help of descriptive statistics.

RESULTS

Table 2 summarizes the total response of all individuals. It is quite evident from the present study that majority of participants 56.36% stated 1-5 drugs were left-over drugs at their homes. Most of the leftover medicines were analgesics in 59.1% followed by antibiotics in 51.36% and antacids in 38.1% of individuals.

Most common dosage form of these leftover medicines were tablets in 85.9% of respondents. Majority of the respondents (55.9%) were not aware of the adverse outcomes of the pharmaceuticals in the environment.

The most common reason cited for possessing the unused medicines at home was self-discontinuation of taking the medicines while recovery from disease in 56.81% of consumers followed by leftover from over the counter (OTC) in 48.1% of consumers. The most common method followed by majority of the participants for disposing of the solid, semi-solid and liquid dosage forms was garbage in 95%, 91.4% and 76.4% of consumers respectively.

About 9.31% of the participants were in favour of initiating a program to collect unused medications from home. About 70.9 % of consumers were in favour of imparting education by pharmacists, doctors and nurses regarding the safe disposal of medications.

Table 1: Drug Disposal Questionnaire

Question	(a)	(b)	(c)	(d)	(e)	(f)	(g)
No. of unused /leftover drugs at your home	0	1-5	6-10	11-15	16-20	>20	
Classes of unused/expired drugs present at your home	Anti-biotics	Anti-pyretics	Anal-gesics	Ant-acids	Anti-histaminics	Vitamins/Syrups	Topical Drugs (eyedrops, cream ointments)
Most common leftover dosage form at home	Tablets	Capsules	Syrups	Respules	Lozenges	Creams/Ointments/lotions	Others (Specify)
Have you ever received any information about how to dispose unused and unwanted medications	Yes	No					
Reasons for possession of unused medications at home	Doctor changed treatment	Prescribed more than needed	Self-discontinuation after condition resolved	Leftover from previous OTC drug purchase	Passed expiry date	Adverse effect to prescribed drug	Others
Awareness regarding adverse outcomes of pharmaceutical in the environment	Yes	No					
How do you get rid of or dispose of unused and unwanted medications	Solids		Semi-solids		Liquids		
	(i) Toilet (ii) Sink (iii) Garbage		(i) Toilet (ii) Sink (iii) Garbage		(i) Toilet (ii) Sink (iii) Garbage		
What do you think which is acceptable method to dispose of medication	Rinsing down a sink	Flushing down a Toilet	Returning to pharmacist	Municipality/Collect on at home	Giving away to friends	Others (specify)	Multiple methods
Do you know about any drug-take-back system?	Yes	No					
Do you think that there is a need for a program to collect unused medicines from home?	Yes	No					
Do you think that consumers should be made more aware about the hazards of unsafe disposal & methods of safe disposal?	Yes	No					
What measures do you suggest to improve awareness of consumers regarding safe disposal of medicines?	Patient education by pharmacists, doctors or nurses	Provision of information in newspapers, Television or posters	Awareness programs by the government	Education by village health workers	Written instructions on medicines		

Table 2: Total no. of responses of all individual.

(a)	(b)	(c)	(d)	(e)	(f)	(g)
3 (1.36%)	124(56.36%)	66(30.0%)	25 (11.36%)	2 (0.9%)		
113(51.36%)	66(30.0%)	130(59.09%)	84(38.18%)	97(44.09%)	14(6.36%)	
189(85.9%)	53(24.09%)	115(52.27%)	13(5.9%)	5(2.27%)	137(62.27%)	
8(3.63%)	212(96.36%)					
93(42.27%)	29(13.18%)	125(56.81%)	106(48.18%)	82(37.27%)	15(6.8%)	
97(44.09%)	123(55.9%)					
	7(a)	7(b)	7(c)			
	7(i) 11(5%)	7(i) 4(1.8%)	7(i) 20(9.1%)			
	7(ii) 0(0%)	7(ii)15(6.8%)	7(ii)32(14.5%)			
	7(iii)209(95%)	7(iii)201(91.4%)	7(iii)168(76.4%)			
7(3.2%)	14(6.4%)	69(31.41%)	135(61.4%)	12(5.4%)		
2(0.9%)	218(99.09%)					
205(93.18%)	15(6.81%)					
209(95%)	11(5%)					
156(70.9%)	52(53.6%)	73(33.18%)	42(19.09%)	93(42.27%)		

DISCUSSION

With the global increase in the use of pharmaceuticals, the contamination of environment via these micro pollutants is also increasing at an alarming rate. Many countries including US Food and Drug Administration (USFDA) have framed certain guidelines for the proper disposal of the medications.¹⁵ In India, the national formulary published in 2011, provides guidelines on the same.¹⁴ However, still awareness and knowledge pertaining to the safe disposal of unused medications is lacking in general public.

In the present study, majority of the consumers (56.36%) had 1-5 unused drugs at their homes. Most common leftover dosage form at home was tablets as reported by 85.9% of the consumers. Most of the unused drugs stored at home belongs to the analgesics in 59.09% followed by antibiotics in 51.36% of consumers. This is in accordance to previously published studies.¹⁶ Pain is a commonly encountered symptom in many diseases. Pre-mature stoppage of pain-relieving medications and stocking of medications for future use explain this observation. Moreover, medicines stored by consumers were those that were required for other common ailments such as fever, cough, epigastric distress and for generalized weakness. Although sometimes it is necessary to have such medications at home, but it is necessary to make people aware of the safe disposal of these medications.

In the present study, only 3.63% of consumers were having information regarding safe disposal of medications and majority of the consumers throw or dispose of left-over medicines into the garbage. This is consistent with the previously published studies.^{17,18} Throwing of left-over drugs in the garbage might be considered as an easy practice and less time-consuming method by most of the consumers. This method however, increases the risk of misuse and/or accidental exposure to drugs. Many consumers did not seek any advice regarding safe disposal of medications. Thus, they think the method adopted by them for disposal of medications as correct. However, this also implies the poor knowledge regarding the safe disposal of medications among the consumers.

Many participants (93.1%) felt the need of drug take back program. A take back program will provide timely disposal methods and may lessen likelihood of medication waste going through the sewage system, and hence environmental pollution may be prevented. Many participants (95%) also felt the need to increase awareness among the general public regarding the methods of safe disposal of medications and hazards of unsafe disposal of medications. In this regard, many consumers (70.9%) sought education by pharmacists, doctors or nurses regarding proper practices for the safe disposal of medications. This is consistent with the previously published studies.^{19,20}

CONCLUSION

From the present study it can be concluded that the consumers had poor knowledge regarding the safe drug disposal techniques. Therefore, it is the need of the hour to take stringent actions and formulate uniform guidelines on the safe disposal of medicines. Moreover, safe disposal instructions should be provided by all healthcare providers to patients in routine practice. Thus, efforts need to be done by every section of the society for the safe disposal of medications in order to create a safe environment for future.

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REFERENCES

1. Atinafu T, Takele A, Kassie A, Yehualaw A, Tesfaw G, Desseno T, et al. Unused medications disposal practice: The case of Patients visiting university of Gondar specialized teaching Hospital, Gondar, Ethiopia. *Int J Pharm Sci Res.* 2014;5(12):999-1005.
2. Tong AY, Peake BM, Braund R. Disposal practices for unused medications around the world. *Environment international.* 2011 Jan 1;37(1):292-8.
3. Kümmerer K. The presence of pharmaceuticals in the environment due to human use-present knowledge and future challenges. *J Environmental Management.* 2009 Jun 1;90(8):2354-66.
4. Medhi B, Sewal RK. Ecopharmacovigilance: An issue urgently to be addressed. *Indian J Pharmacol.* 2012 Sep;44(5):547.
5. Holm G, Snape JR, Murray-Smith R, Talbot J, Taylor D, Sörme P. Implementing ecopharmacovigilance in practice: challenges and potential opportunities. *Drug Safety.* 2013 Jul 1;36(7):533-46.
6. Bound JP, Voulvoulis N. Household disposal of pharmaceuticals as a pathway for aquatic contamination in the United Kingdom. *Environmental health perspectives.* 2005 Dec;113(12):1705.
7. Daughton CG. *Drugs and the Environment: Stewardship and Sustainability.* National Exposure Research Laboratory, Environmental Sciences Division, US EPA, Las Vegas, Nevada, Report NERL-LV-ESD 10/081, EPA/600/R-10/106, 2010. Available at: <http://www.epa.gov/nerlesdl/bios/daughton/APM20-0-2010.pdf>. Accessed on 11 February 2018.

8. Kvarnryd M, Grabic R, Brandt I, Berg C. Early life progestin exposure causes arrested oocyte development, oviductal agenesis and sterility in adult *Xenopus tropicalis* frogs. *Aquatic Toxicol.* 2011 May 1;103(1-2):18-24.
9. Colborn T, Vom Saal FS, Soto AM. Developmental effects of endocrine-disrupting chemicals in wildlife and humans. *Environmental Health Perspectives.* 1993 Oct;101(5):378-84.
10. Al-Shareef F, El-Asrar SA, Al-Bakr L, Al-Amro M, Alqahtani F, Aleanizy F, Al-Rashood S. Investigating the disposal of expired and unused medication in Riyadh, Saudi Arabia: a cross-sectional study. *Inter J Clin Pharm.* 2016 Aug 1;38(4):822-8.
11. Ruhoy IS, Daughton CG. Beyond the medicine cabinet: An analysis of where and why medications accumulate. *Environment International.* 2008 Nov 1;34(8):1157-69.
12. Seehusen DA, Edwards J. Patient practices and beliefs concerning disposal of medications. *J Am Board Family Med.* 2006 Nov 1;19(6):542-7.
13. Swaroop HS, Charaborty A, Virupakshaiah A. Knowledge, attitude and practice of medical professionals towards the safe disposal of unused medications in South India. *World J Pharm Pharm Sci.* 2015 Mar 7;4(5):1423-30.
14. Government of India. Ministry of Health and Family Welfare. National Formulary of India, 2011. Available at: https://Www.Nhp.Gov.In/National-Formulary-Of-India_Mtl. Accessed 10 November 2013.
15. FDA. Where and How to Dispose of Unused Medicines. Available at: www.fda.gov/ForConsumers/ConsumerUpdates/ucm101653.htm. Accessed 5 November 2013.
16. Sirisha A, Janardhan M, Sree PK, Rao YV, Raikar SR, Patil S, et al. Knowledge, attitude and practice on safe disposal of medicines among medical and dental undergraduates. *J Basic Clin Res.* 2016;3(1):5-9.
17. Lagishetty R, Nagarajan P, Vijayanandhan SS. Practice towards disposal of medicines (left out/expired drugs) among the patients visiting tertiary care teaching hospital and primary health centre in South India. *Asian J Biochem Pharm Res.* 2016;4:175-82.
18. Gupta D, Gupta A, Ansari NA, Ahmed OS. Patient's opinion and practice towards unused medication disposal: A qualitative study. *J Pharm Sci Innov.* 2013;2:47-50.
19. Aditya S. Safe medication disposal: Need to sensitize undergraduate students. (*IJPLS*). 2013;4(3):2475-80.
20. Patel V, Chatterjee S, Chishlom D, Ebrahim S, Gopalakrishna G, Mathers C, et al. Chronic diseases and injuries in India. *Lancet.* 2011;377:413-28.

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