

Impact of Educational Intervention on the Awareness of Disposal of Leftover/Expired Medicines among Health care Professionals

Sir,

Medicines are prescribed and consumed for various reasons and sometimes patients do not finish the medicines completely and hence these medicines end up in the medicine cabinets, drawers, or else are disposed in the household trash.^[1] Failure to properly store and dispose unused medicines can contribute to accidental consumption by children or pets and inappropriate use by drug seekers; on the other hand, they can also find their way into the environment. Literature suggests that pharmaceuticals are present in low levels in a high percentage of tested surface water, ground water, and drinking water supplies.^[2] Some studies have found significant effects on wildlife, for example, decrease in the population of vulture species^[3] and aquatic life, for example, demasculinization and feminization of male fish.^[4] Some studies also link development of antibiotic resistance and abnormal thyroid function to this problem.^[5] Countries such as the USA, the UK, and some others in the Middle-East region have taken steps in educating people on proper disposal of medicines. Countries like the USA and Sweden have even started “Community drug back programmes.”^[6] However, in India, we are still not aware of the problem and its implications. Hence, a questionnaire-based experimental study was carried out after approval from the Institutional Ethics Committee to elicit the knowledge, attitude, and practices of the health professionals working in a medical institute about the drug disposal with the aim of addressing the gaps in an educational program to suggest possible remedial actions to curb the problem. The impact of educational intervention was also evaluated. The study population ($n = 144$, convenient sampling) consisted of the faculty members, including junior residents working at N.C. Medical College and Hospital (NCMCH), Israna, Panipat. Written informed consent [Annexure 1] was taken before administering the questionnaire [Annexure 2]. The gaps found in knowledge and the practices about disposal of medicines were addressed in a highly interactive educational program where they were educated about the magnitude of the problem, ill effects of the unsafe disposal practices, and the possible remedial actions which could be taken to curb the problem. Evaluation of effectiveness of the program was done by a retrospective pre-post self-assessment questionnaire [Annexure 3] and a feedback questionnaire [Annexure 4]. Data collected were analyzed for descriptive statistical analysis using IBM SPSS version 20 (USA). The results obtained were presented in the form of frequencies and percentages. All Likert survey responses (1–5) were

categorized into positive (strongly agree, agree), neutral, and negative responses (disagree and strongly disagree). In the preinterventional survey, the response rate was 100%. There were 55.55% and 44.45% of females and males, respectively, and the mean age of the participants was 38.49 years. It was found that all the participants (100%) have leftover/unused (unexpired) medicines at home, 47.9% keep them for future use, whereas 50% would dispose them off as shown in Figure 1. It was also revealed that 77.1% have leftover (expired) medicines at home and 80.6% of them would throw them in the dustbin. Nearly 59% were aware that routine methods of drug disposal are not safe for our environment, but they did not state the impact of these methods. Almost 28.5% were not sure and 12.5% are not aware about the impact of disposal methods. Nearly 100% felt the need of information on safe disposal of medicines. The educational session began with brainstorming about the fate of the drugs consumed by the public, followed by highlighting the impact of drugs on the environment and potentially on human beings and the possible remedial actions to curb the problem. The session was perceived very positively by the participants. Retrospective pre-post analysis revealed very high statistically significant increase in the knowledge ($t = 25.77$, $P = 0.00001$) of participants. Feedback and perceptions of participants about the session are depicted in Figure 2. A few studies have been conducted earlier also. In a study by Lagishetty *et al.*, it was found that 65.5% of the patients would throw the drugs in the dustbins.^[7] In a similar study by Aditya, conducted on the dental undergraduate students, it was revealed that the predominant channel of disposal of leftover drugs was household trash.^[8] A study in New Zealand community pharmacies reported that many drugs of a particular class were drained down the sink or the toilet.^[9] Nearly 62% of the

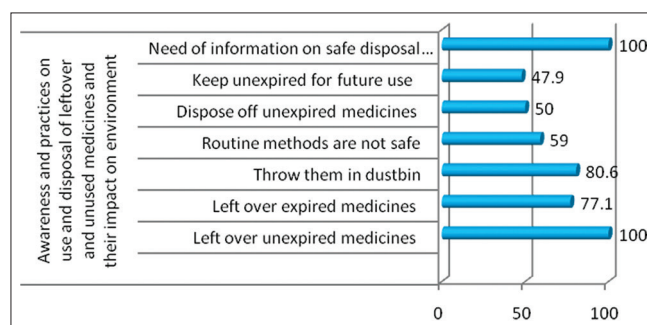


Figure 1: Bar diagram indicating the percentage of participants responding to items in questionnaire

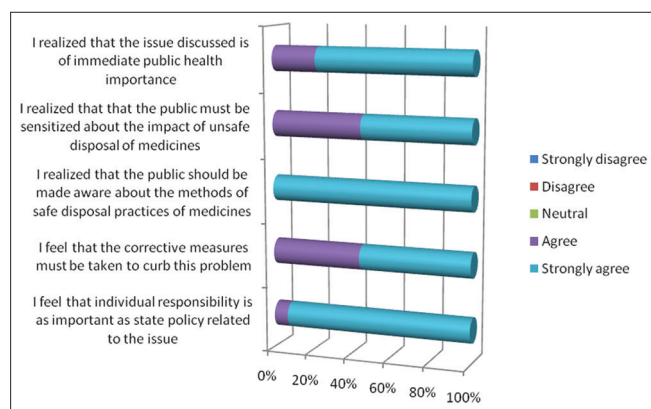


Figure 2: Feedback and perceptions of the participants about the educational intervention on Likert scale

undergraduate students in a university were also reported to dispose the drugs down the drain or the sink.^[10] Our study revealed that 59% of respondents stated that they were aware that routine methods of drug disposal are not safe for our environment, but they did not state the impact of these methods on the environment. A significant number of participants stating their awareness might be indicative of social desirability bias, but when asked to respond objectively, they were at loss. What is unique and critical to note in our study is that the participants were health professionals, who are expected to be equipped with the right information related to the drugs, the results are surprisingly no different from other studies conducted on patients and students.^[7-10] Midway through the session, suggestions were elicited from the participants; interestingly, many points came out, for example, a hospital/pharmacy can be identified in a community and the public can be encouraged to deposit the unwanted medicines at those places. Interestingly, it was suggested that an app can be developed which could be linked to the prescription of the patient, which would send an alert to the patient to either refill the prescription or do something with the leftover drug, if any. The authors suggest that one basic app can be in such a form that the patient/consumer feeds the date of manufacturing and the date of expiry in the app and the app sends a prompt or an alert to the patient near the expiry of the medicines. How much in advance of the expiry date one would like to receive the message can be customized. We have taken this lead from the basic organizers in our smartphones. Something similar can be seen in the smartphones about the data consumption, in which the consumer receives an alert that the data are near consumption. The participants also recognized it as a problem of national importance, so a nationwide program needs to be initiated. In our study, the participants self-reported the increase in their awareness about the problem stated and the remedial measures, which indicates that such programs can be utilized to increase the awareness of the public. Hence, to conclude, drugs can affect the environment negatively and significantly, and inappropriate disposal of the medicines contributes to this problem, but the public is largely unaware about the issue. The educational intervention was found to be

effective in increasing the awareness about the impact of unsafe and safe methods of disposal of medicines. It is suggested by the authors that the public should be educated about the impact and possible remedial measures with the hope that, when they are equipped with the relevant knowledge, they will be in a better position to educate/inform others (family, friends, patients, and general public) about the practice of safe methods of drug disposal. As a way forward, a “drug take-back program” was proposed to be initiated at the NCMCH, which was seconded by most of the participants. There are multiple components of the drug take-back program; faculty sensitization about the issue, which in turn educate and motivate their patients to bring back the unused or leftover medicines to the hospital, deposit them in the hospital pharmacy, or drop them in the dedicated box earmarked and labeled for collecting the medicines. The box is opened every week and the medicines are segregated and disposed off or sent to the central pharmacy for reuse or resale for free, for the expired and unexpired medicines, respectively. Meanwhile, the people in the community are also educated about the facility of drug take back in the hospital. Educating people in the community can be undertaken in collaboration with the department of community medicine. Students can also be roped in for this noble community-oriented initiative. In order to reinforce, some boards or flex containing the information on this program can be displayed in the outdoor and also cabins of the physicians. The multipronged approach may result in adopting safe disposal practices by the public and benefit the society in the long run. The study sample was drawn from the faculty members working in a teaching hospital and the results obtained may not be indicative of the practices of the general population. The present study has been evaluated by perceptions of the participants and the increase in their knowledge in a self-reported retrospective-pre-questionnaire, the gain in awareness may not culminate in the change in practices; hence, a long-term follow-up would be needed to assess the changed attitudes and practices.

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Conflicts of interest

There are no conflicts of interest.

Manoj Goyal, Monika Bansal¹, Anurag Bajpai, Aboobeker Siddique, R. K. Srivastava

Departments of Pharmacology and ¹Physiology, N.C. Medical College and Hospital, Panipat, Haryana, India

Address for correspondence: Manoj Goyal, Department of Pharmacology, N.C. Medical College and Hospital, Israna, Panipat - 132 107, Haryana, India. E-mail: dr_manojgoyal@yahoo.co.in

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ANNEXURES

Annexure 1

Informed Consent Document

Annexure 2

Please tick mark or write down your responses to the following questions.

- 1). Sex _____ 2). Age _____
 - 3). Do you have leftover/unused (**unexpired**) medicines in your home?
 - a) Yes b) No
 - 4). If yes, then what do you do with these leftover (unexpired) medicines?
 - a) Keep them for the future use for yourself/family/friends/relatives
 - b) Dispose them off
 - c) Anything else _____
 - 5). Do you have leftover (**expired**) medicines in your home?
 - a) Yes b) No
 - 6). How do you dispose off (expired/unexpired/leftover/unwanted) medicines?
 - a) Drain it in the sink. b) Flush it in the toilet.
 - c) Throw it in the dustbin. d) Any other methods _____
 - 7). Are you aware that our routine methods of drug disposal (in the sink, toilet, dustbin) are not safe for our environment/ecosystem?
 - a) I am aware b) I am not sure c) I am not aware
- In case you are aware, what is the impact.....
- 8). Do you think you need information on the issue of safe disposal of the medicines?
 - a) Yes b) No c) Don't know

Annexure 3

Retrospective-pre self-evaluation form

Dear participant,

Please **retrospect** and analyze for the different subtopics you learned in this program and rate the level of your knowledge and awareness about them. Please tick in the appropriate boxes.

(1: No knowledge, 2: little knowledge, 3: average knowledge, 4: good knowledge, 5: expert in the topic)

Before program					Topic	After program				
1	2	3	4	5		1	2	3	4	5
					Methods of unsafe disposal of medicines					
					Awareness about the magnitude of the problem due to unsafe disposal of medicines					
					Impact of unsafe disposal of medicines on the environment					
					Possible impact of unsafe disposal of medicines on human life					
					Methods/practices for safe disposal of medicines					
					Importance of educating/informing the public about the problem					
					Possible actions/methods to disseminate the information to the public to curb the practices					

Annexure 4

Feedback on the relevance and effectiveness of the program

Dear participant, the purpose of this questionnaire is to obtain your feedback about your experience in the sessions which you underwent during this workshop. You may not reveal your identity. Your response will be held confidential and will be used only for academic and research purposes.

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I realized that the issue discussed is of immediate public health importance					
I realized that the public must be sensitized about the impact of unsafe disposal of medicines					
I realized that the public should be made aware about the methods of safe disposal practices of medicines					
I feel that the corrective measures must be taken to curb this problem					
I feel that individual responsibility is as important as state policy related to the issue					
Anything else you want to state _____					