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Original Research Article

A study on awareness and disposal practices of unused and expired medicines by consumers

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ABSTRACT

Background: Hazards to the environment due to improper drug disposal practices is an issue of concern. The prescription drugs, disposed into trash /sewage, consequently enter into surface waters and contaminate even drinking water. In view of the potential hazards posed due to improper storage and disposal of medicines, evaluation of the awareness of the consumers and educating them about proper disposal methods is required. The aim of present study was to evaluate the awareness and practice of drug disposal among the population.

Methods: A cross sectional, observational study was conducted at Rural Health Centre (RHTC) of Kamineni Academy of Medical Sciences and Research Centre with the patients visiting the RHTC as the study subjects. A predesigned questionnaire was used to evaluate the awareness and disposal practices of unused and expired medicines by the respondents.

Results: On analysis it was observed that 80 (57%) of the respondents procure medicines from health care centre. A total of 97 (69%) respondents possess unused/leftover medicines at home, 54 (39%) of the respondents mentioned the reason to be due to self discontinuation. Among the class of drugs left unused antibiotics constituted 13%, antipyretics 6%, analgesics 6%. 49% of the respondents dispose unused medicines in domestic trash, 24% flush down toilet/sink. A majority of 121 (86%) opined that awareness must be made created.

Conclusions: In present study it was observed that many of the respondents possessed leftover medicines and were unaware of the hazards of improper disposal of medicines. Thus, there is a need for proper educational and regulatory interventions.

Keywords: Awareness, Disposal of medicines, Hazards of improper disposal, Leftover medicines, Unused medicines

INTRODUCTION

Medicines play an important role in prevention and treatment of various diseases and conditions. All over the world, it has been estimated that medicines are prescribed and dispensed inappropriately.¹ In addition to that medicines are even stored and disposed inappropriately, paving way for hazards to the mankind and environment. Ecopharmacovigilance can be defined as science and

activities concerning detection, assessment, understanding, and prevention of adverse effects or other problems related to the presence of pharmaceuticals in the environment, which affect human and other animal species.²

In the first place excess or inappropriate prescription of drugs and lack of adherence to the prescribed course leads to chances of stocking up of left over drugs or improper

storage of drugs. This leads to a threat of unintentional poisoning and self medication (without doctors orders). The left over or expired medicines are disposed inappropriately in the domestic trash and toilets/sinks, leading to a threat to the environment, all the living species including humans. The prescription drugs, through trash/sewage, consequently enter into surface waters and contaminate even drinking water.

Many pharmaceutical molecules have been investigated and detected in water bodies. These include antibiotics, analgesics/anti-inflammatory drugs, antidepressants, beta blockers.³ Thus, human beings and other living species are exposed directly or indirectly to drugs through the environment.

There are many instances of the consequences of drugs polluting the environment. Decline in the population of vultures feeding on livestock carcasses due to veterinary use of diclofenac, decrease in the number of frogs because of sterility due to exposure to traces of progestins and ethinyl estradiol in water and behavioural changes in fish due to pharmaceuticals in aquatic systems are some examples of impact of environmental contamination with drugs.^{4,6} An issue of utmost importance is antimicrobial resistance due to continuous exposure to antimicrobials through drinking water.^{7,8}

Left over medicines disposed inappropriately, contribute to a significant extent to environmental contamination.^{8,9} The patients are given instructions regarding the use of medicines but are not educated regarding proper disposal of medicines. They resort to improper disposal practices.

Many studies were conducted assessing the knowledge and practices of the consumers related to proper drug disposal practices.¹⁰⁻¹³ All the studies addressed the need for educational and regulatory interventions for establishing proper drug disposal practices.

Educating the consumers regarding proper storage practices to avoid accidental ingestion by children, timely disposal of expired medicines and proper disposal methods is necessary. Ideally, implementing a medication take back program as in the U.S. helps in proper disposal of medicines and in reducing risk to environment and mankind.¹⁴ Steps are suggested for disposal of unused/expired pharmaceutical products by the Indian Pharmacopoeia commission in Appendix 4 of the National Formulary of India (4th edition 2011).¹⁵ In spite of the measures suggested the practice of improper disposal of unused medicines prevails.

In view of the potential hazards posed due to improper storage and disposal of medicines, evaluation of the awareness of the consumers and their practices related to drug disposal and educating them about proper disposal methods and planning out an effective drug take back program at community level is required.

Present study aims at evaluating the awareness and practice of drug disposal among the population and at evaluating the methods adopted by the consumers for drug disposal.

METHODS

Study design

A prospective cross sectional observational study was conducted during the period of May-June 2019 in the Rural Health centre (RHTC) of Kamineni Academy of Medical Sciences and Research Centre.

Study population

Patients attending the rural health centre (RHTC) and willing to participate were included in the study. The study population was explained about the purpose of the study and informed consent was taken.

Data collection

Data was collected by using a predesigned, pretested questionnaire. The first part of the questionnaire included demographic details of the respondents like age, sex, educational status, employment status and residential area. The other questions were addressed towards the practices of the respondents such as possession of unused/leftover medicines at home (response as yes/no), if yes the class of medicines stored, reason for possession of unused medicines, storage practices and method of disposal of unused/ leftover medicines. The questionnaire included some questions pertaining to the awareness of the respondents regarding the hazards of improper disposal practices, and proper method of drug disposal and the response was taken as yes/no. If the response was yes then they were asked 'what are the hazards?' and 'what are the proper methods of disposal?' In the later part of the questionnaire some questions were addressed towards the perception of the respondents like "Do you think people must be made aware of the hazards of improper disposal of medicines?", "Best possible way to stop hazards of unused medicines on human health, environment and animal life?" and "Methods for educating people regarding safe disposal of drugs".

Data analysis

Data was collected and entered in M.S Excel. Results were expressed (as percentages) in Tabular forms/graphs.

RESULTS

The present study was conducted in Rural Health centre of Kamineni Academy of Medical sciences and research centre, LB Nagar. A total of 140 respondents participated in the study. Among the respondents there were 55(39%) females and 85 (61%) males shown in Table 1. The demographic variables like age distribution, educational

status, Occupation and residential area of the respondents is presented in.

Table 1: Table representing demographic variables.

Demographic variables	No. of respondents (%)
Age group (in years)	
18	1 (0.7)
22-25	14 (10)
26-30	18 (13)
31-35	22 (16)
36-40	16 (11)
41-45	18 (13)
46-50	15 (11)
>50	36 (26)
Sex	
Female	55 (39)
Male	85 (61)
Educational status	
Illiterate	22 (16)
Primary school	40 (29)
Secondary school	41 (29)
Intermediate	21 (15)
Graduation	13 (9)
Postgraduation	3 (2)
Occupation	
Unemployed	37 (26)
Unskilled	29 (21)
Semiskilled	48 (34)
Skilled	17 (12)
Semiprofessional	6 (4)
Professional	3 (2)
Residential area	
Rural	79 (56)
Urban	61 (44)

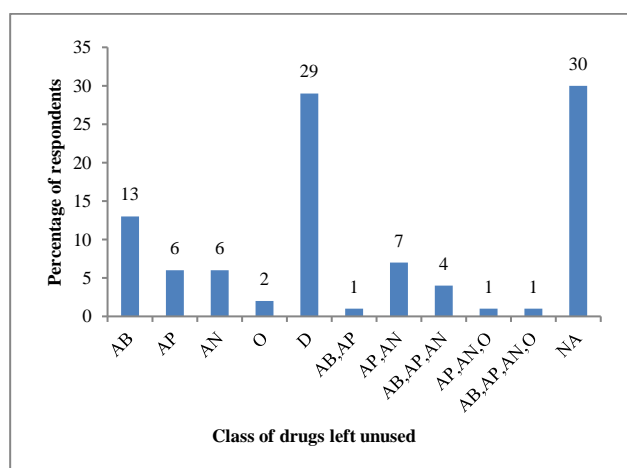


Figure 1: Chart showing the class of drugs left unused and stored at home.

AB-Antibiotics; AP-Antipyretics; AN-Analgesics; O-Others; D-Don't know; NA-Not attempted

On analysis of the practices of the respondents it was observed that 80 (57%) of the respondents procure medicines from health care centre, 26 (19%) from medical stores with doctors prescription, 6 (4%) from Over the counter purchase and 4 (3%) from medical store without prescription (Table 3).

It was observed that a total of 97(69%) of the respondents possess unused/leftover medicines at home (Table 2). On analysis of the reasons for presence of unused medicines it was observed that 54 (39%) of the respondents mentioned the reason to be due to self-discontinuation, 9 (6%) had purchased more than needed for future use, 4% due to change in prescription, 4% possessed medicines which have crossed expiry date and 3% due to discontinuation as a consequence of adverse drug reaction (Table 4). Among the class of drugs left unused, antibiotics constituted 13%, antipyretics 6%, analgesics 6% and 29% of the respondents didn't know the class of drugs which were left over/unused (Figure 1).

Table 2: Awareness and practices of respondents towards drug disposal practices and hazards of improper drug disposal.

Questions related to awareness and practices	Yes (%)	No (%)
Do you have any unused medicines at home	97 (69)	43 (31)
Do you store medicines at sites accessible to children	71 (51)	69 (49)
Are you aware of hazards of improper disposal of medicines	66 (47)	74 (53)
Are you aware of safe methods of drug disposal	72 (51)	68 (49)
Did you receive instructions for safe disposal of medicines	81 (58)	59 (42)
Do you think people must be made aware of the hazards	121 (86)	19 (14)

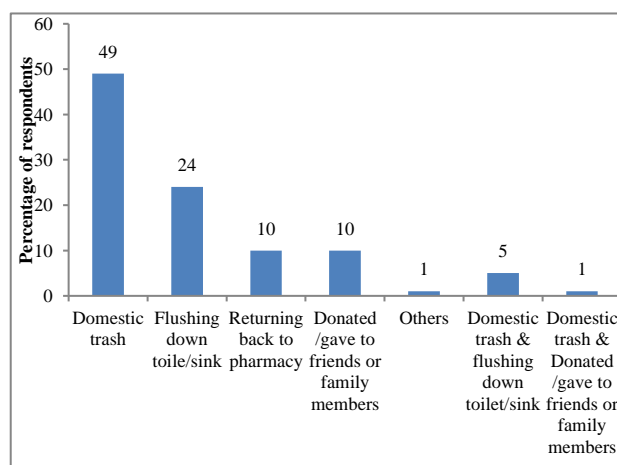


Figure 2: Methods of disposal of unused medicines adopted by the respondents.

It was observed that 71(51%) respondents stored medicines at sites accessible to children (Table 2). On evaluating the disposal practices it was observed that 49% of the respondents dispose unused medicines in domestic trash, 24% flush down toilet/sink, 10% return back to pharmacy and 10% of the respondents give the unused medicine to family members/friends (Figure 2).

On evaluating the awareness of respondents towards the hazards of improper disposal of medicines, 74 (53%) respondents were not aware of the hazards (Table 2). Among the respondents 72 (51%) were aware of safe methods of drug disposal. When asked about the safe methods 54 (39%) respondents return the leftover medicine to health care centre, while 16 (11%) return to pharmacy (Table 5).

Table 3: Sources of medicines procured by the respondents.

Source of medicines	Number of respondents (%)
Over the counter	6 (4)
Health care centre	80 (57)
Medical stores with doctor's prescription	26 (19)
Medical stores without prescription	4 (3)
Other sources	1 (1)
More than one of the above response	23 (16)

Table 4: Reasons for presence of unused medicines at home.

Reason for presence of unused medicines at home	Number of respondents (%)
Change in the prescription	5 (4)
Self discontinuation	54 (39)
Dispensed more than needed	6 (4)
Medicine crossed expiry date	5 (4)
Left over from previous OTC purchase	1 (1)
Purchased more than needed for future use	9 (6)
Discontinued due to adverse drug reaction	4 (3)
More than one of the above reasons	14 (10)
Not attempted	42 (30)

A total of 81(58%) participants responded that they received instructions for safe disposal of medicines. A majority of 121(86%) respondents were of the opinion that people must be made aware of the hazards (Table 2).

Among the respondents 60(43%) were of the opinion that creating awareness among the people is the best way to stop hazards, 42(30%) respondents were of the opinion that

conducting take back program is the best way and 19(14%) of respondents were of the opinion that stringent rules on purchase and dispensing of medicines is the best way (Figure 3).

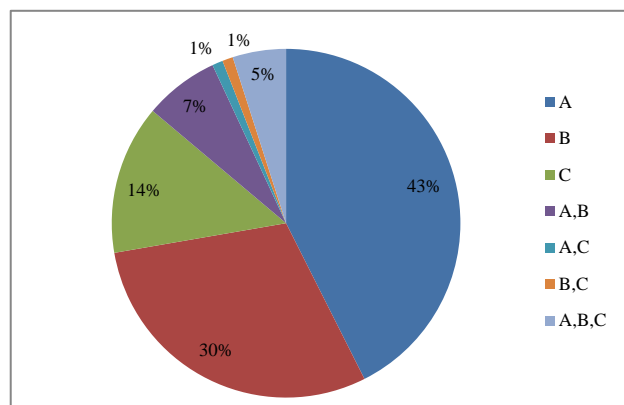


Figure 3: Chart showing the responses regarding best way to stop hazards of improper drug disposal.

A- Creating awareness among the people; B- Conducting drug take back programs; C- Stringent rules on purchase and dispensing of medicines.

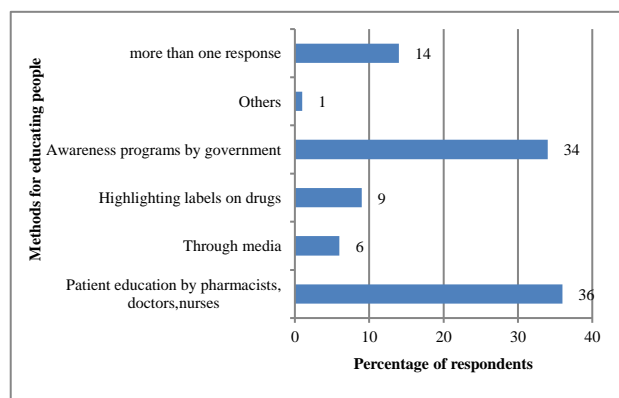


Figure 4: Methods for educating people regarding safe disposal of drugs.

On evaluating the methods for educating people regarding safe disposal of drugs, the opinion of 36% of respondents was education by pharmacists, doctors, nurses, followed by 34% opting for awareness programs by government, followed by 9% opting for highlighting labels on drugs (Figure 4).

Table 5: Methods of safe disposal of drugs according to the respondents.

Methods of safe disposal of drugs	Number of respondents (%)
Return to pharmacy	16 (11)
Return to health care centre	54 (39)
Return to pharmacy and return to health care centre	2 (1)
Not attempted	68 (49)

DISCUSSION

In present study majority of the respondents were males (61%) and majority of them were educated upto primary school, and secondary school level. A majority of 57% of the respondents had procured medicines from health care centre, while only 3% of the respondents had procured medicines from medical stores without prescription. In a study by Sonowal et al 60.5% of the respondents procured medicines from pharmacy with doctor's prescription but a greater number of respondents (20%) had procured medicines without prescription when compared to our study.¹⁰

On evaluating the practices of respondents it was observed that 69% of the respondents had leftover/unused medicine at home. Similar findings were there in the study by Sonowal S et al.¹⁰ In a study by Bashaar M et al 95.3% of the respondents had unused medicines at home.¹² Majority (29%) of the respondents didn't know the class of medicines left over with them. Among the class of drugs left unused, antibiotics constituted a significant proportion. The most common reason for presence of leftover/unused medicines was self-discontinuation (39% of the respondents). A significant number (51%) of respondents store medicines at sites accessible to children. On evaluation of disposal practices it was observed that majority (49%) of respondents discarded unused medicines in domestic trash, followed by 124% of respondents flushing down sink/ toilet, while only 10% of them return back the unused drugs to pharmacy. In other studies also the majority of the respondents had disposed the leftover medicines into domestic trash.¹⁰⁻¹³

On evaluating the awareness of the respondents it was noted that 53% of the respondents were unaware of the hazards of improper disposal of medicines. This could be the reason behind the practices followed for disposal of unused medicine by the respondents and points towards the need for creating awareness among the people regarding the hazards of improper drug disposal practices and proper methods of drug disposal. It was observed that 51% of respondents were aware of safe methods of drug disposal and despite the awareness of proper methods of drug disposal only 10% of the respondents returned unused medicines back to the pharmacy.

On questioning about the instructions received for safe disposal of medicines 58% had accepted that they received instructions.

On evaluating the opinion of the people regarding the issue and the methods to tackle the problem, it was observed that 86% of the respondents were of the opinion that awareness should be created regarding the hazards and 36% of the respondents were of opinion that patient must be educated by pharmacists, doctors and nurses, and 34% opined that awareness programs by government are the methods for educating people regarding safe disposal of drugs. Similar findings were observed in study by Sonowal et al.¹⁰

Methods for disposal of pharmaceuticals and personal care products (PPCP) are mentioned in the National Formulary of India, which suggests that the expired or unused medicines should be returned by the chemists, druggists, pharmacies, clinics, hospitals to the manufacturers for proper disposal.¹⁵ Despite this, there are incidences of pharmaceutical drugs and their metabolites in aquatic and terrestrial ecosystems. The compounds enter the ecosystem due to discharge of pharmaceutical effluents which are not treated and improper disposal of expired or unused drugs.¹⁶ The pharmaceutical residues may also enter the ecosystem through excretion of animals and human beings, sewage treatment plants. Thus there is a need to implement required strategies for proper management of disposal of medicines. There is a need to conduct drug take back programs and frame guidelines for managing proper disposal of unused/leftover medicines. There is a need to conduct awareness programs and sensitize all stakeholders involved in use of and disposal of medicines.

CONCLUSION

In present study on evaluation it was observed that many of the respondents were possessing unused/leftover medicines and were not aware of the hazards of improper disposal of medicines and were not aware of proper methods of drug disposal. Though a significant proportion of the respondents were aware of the hazards, the disposal practices followed by the respondents are not satisfactory. Thus, there is a need for proper educational interventions in the form of awareness programs and regulatory interventions, with the government, media, pharmacists, health professionals and the consumers as the main stakeholders.

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