

Current Disposal Practice Trends of Unused and Expired Medicines Among General Public in Hegde Nagar, Bangalore, India.

¹Sharad Arun Nigam, ²Balakeshwa Ramaiah

¹Pharm.D intern, ²M.Pharm, PhD, HOD Pharmacy Practice

¹Department of Pharmacy Practice,

¹ Karnataka College of Pharmacy, Bengaluru, Karnataka, India.

Abstract:

Background Among all the medications which are being prescribed to meet the ever-growing needs of people seeking better healthcare, not all are being consumed by the patients and enormous quantities are either remaining unused or getting expired. Furthermore, improper disposal of these medications is associated with harm to the environment and ecosystem, hence highlighting the need for proper ecopharmacovigilance.

Objective To explore knowledge, attitude and disposal practices of unused/expired medicines among the general public.

Materials and Methods The current study is a cross-sectional, questionnaire-based study which was conducted among 151 participants in Bangalore, India. data obtained from the study was recorded, transcribed and analyzed in Microsoft Excel 2019 @ for frequency and percentage responses.

Results A high percentage (50.3%) of participants possessed good knowledge score regarding medications. Majority (58.3%) admitted to possessing unused medicines at home. The major disposal practice was found to be throwing in the household garbage the unused (39.7%) and expired medication (60.3%). Almost all (93.4%) of the participants agreed that doctors and healthcare professionals should provide advice on safe disposal of unused and expired household medicines and majority (86.7%) also concurred that drug-take-back programs for unused and expired medicines be made mandatory.

Conclusion There is a critical need to implement a suitable system to educate and guide the population towards safe disposal of unused and expired medicines and healthcare professionals at various levels must actively take part in it to carry it forward in an efficient manner.

key words: Unused medications, Expired medications, Medication disposal, Disposal practice, Population, UEMs

I. INTRODUCTION

There is a global increase in the usage of prescription and over-the-counter (OTC) medications due to an ever-expanding drug market and growth in the number of people seeking better healthcare. However, among all the medications which are being prescribed, not all are being consumed by the patients and enormous quantities are either remaining unused or are getting expired. Expiry of drugs is associated with a compromise in safety, efficacy and potency of the medication and can lead to carcinogenicity, antibiotic resistance and therapeutic failure among other serious issues [1–3]. A household survey study from the Indian subcontinent showed 74.6% of medicines were being stored in the households, and 28.57% medicines were left unused [4]. Reasons for accumulation of these medications in the households may include: oversized medication containers, poor patient adherence; which may be due to forgetfulness or fear of side effects by the patient, improvement in patient's health, self-treatment by the patient which is defined as the selective use of drugs by the patient or their caregiver based on self-diagnosis of the condition(s) [5,6]. Most commonly self-treatment is done for ailments such as headache, fever, joint pain, allergy. Increased ease of access to medications without sufficient improvement in health literacy is leading to an increase in the risk of medication misuse [7].

Improper disposal of expired medications by throwing in trash or garbage, flushing down toilet or sink has major concerns associated to it such as; a) The impact medication wastage will have on the cost of healthcare. b) Inadequate destruction of expired medications by the sewer system leading to their entry in the water supply meant for consumption, hence causing harm to plant and animal life [8]. This was depicted by the anecdotal example of extremely severe decline (>95%) in oriental white back vultures population, due to exposure to Non-Steroidal Anti-Inflammatory Drug (NSAID) DICLOFENAC leading to renal failure and death of vultures in South East Asia [9]. There are international guidelines present regarding safe and appropriate methods for healthcare waste disposal but these aren't properly extrapolated for use by the general public or it was also found that public is generally unaware of these sets of guidelines [10].

As per our knowledge, there is no study conducted which assessed knowledge, attitude and disposal practice among general public in the community of Hegde Nagar, Bangalore. The literature on the same is also lacking in this aspect, therefore this study aims to report on the current knowledge, attitude and disposal practices trend in the general public towards Unused and Expired Medications (UEMs) in Hegde Nagar community, Bangalore, India.

II. MATERIAL AND METHODS

Study Design

This cross-sectional, questionnaire-based study was conducted by the Department of Pharmacology, Karnataka College of Pharmacy; among the local population of Hegde Nagar Region of Bangalore, India from 13th February to 9th June 2021.

Study Population

A total of 151 participants were included in the study based on random convenience sampling; sample size calculation for the study was done beforehand and deemed a minimum sample of 149 was required for the study to be of significance. Participants were chosen based on presence of any exposure towards medication purchase and use. The study population consisted of both genders and of ages between 18 to 65 years. Verbal consent was obtained from the participants prior to the distribution of questionnaire. Participants unwilling to partake in the study were excluded.

Study Instrument

A pre-validated questionnaire consisting of; 6 questions to assess knowledge, 5 to assess awareness and attitude and 3 to assess disposal practices of the participants regarding UEMs was used. The questionnaire was obtained from a previously done similar study and approved by the subject expert from the Department of Pharmacy Practice before the start of the study.

Result Analysis

Responses obtained from the participants was recorded and transcribed into Microsoft Excel 2019 ®. The data was analyzed for frequency and percentage responses.

III. RESULTS

The study evaluated a total of 151 participants, of whom the majority were males (108, 71.5%). The majority among the participants belonged to the age group of 25-35 years (61, 40.4%). Most of the participants were either educated to the level of Secondary school (75, 49.7%) or to college and above (74, 49%), with predominance of self-employment (109, 72.2%) with respect to occupation [Table 1].

Table 1. Demographics of participants

S.N.	Demographic Parameters	(n)%	
1	Gender	Male	108 (71.5%)
		Female	43 (28.5%)
2	Age (years)	18-24	44 (29.1%)
		25-35	61 (40.4%)
		36 and above	46 (30.5%)
3	Education status	Elementary School (classes 1-8)	2 (1.3%)
		Secondary School (classes 9-12)	75 (49.7%)
		College and above	74 (49%)
4	Occupation	Student	21 (13.9%)
		Housewife	9 (6.0%)
		Self-employed	109 (72.2%)
		Governmental employee	12 (7.9%)
5	Marital status	Single	62 (41.0%)
		Married	86 (57.0%)
		Divorced	1 (0.7%)
		Widowed	2 (1.3%)

Evaluation of Knowledge

The majority of the population (101, 66.9%) were unaware of proper medicine disposal instructions, even though a major chunk (89, 59.0%) who were evaluated had assented to possessing knowledge regarding medication waste. Very small proportion (43, 28.5%) of the population were found to be aware of drug-take-back system, while a larger chunk remained unaware (108, 71.5%). A higher proportion of the population (88, 58.3%) were cognizant of the fact that not completing antibiotics course might lead to drug resistance while a smaller quantity (63, 41.7%) remained unaware. A major chunk of the evaluated populace (109, 72.2%) knew that improper disposal of unused and expired medicines can affect health and environment. A huge majority (144, 95.4%) of those evaluated also agreed to checking the expiry date of the medications purchased; while only a handful didn't (7, 4.6%). On assessment of the knowledge score, it was found that about 50.3% of respondents had good knowledge. [Table 2].

Table 2. Evaluation of knowledge

S.N.	Questions		n (%)
1	Do you know about medication waste?	Yes	89 (59.0%)
		No	62 (41.0%)
2	Have you ever read medicine's disposal instructions?	Yes	50 (33.1%)
		No	101 (66.9%)
3	Do you know about drug-take-back system?	Yes	43 (28.5%)
		No	108 (71.5%)
4	Do you know that not completing antibiotics course may cause drug resistance?	Yes	88 (58.3%)
		No	63 (41.7%)
5	Do you know that improper disposal of unused and expired medicines can affect health and environment?	Yes	109 (72.2%)
		No	42 (27.8%)
6	Do you check the expiry date of your medication?	Yes	144 (95.4%)
		No	7 (4.6%)
*Knowledge score			
• Good Knowledge: 76 (50.3%)			
• Poor Knowledge: 75 (49.7%)			

Evaluation of Disposal Practices

The larger part of the participants (88, 58.3%) agreed to possessing unused purchased medicines at home (Fig. 1). The two major practices with regards to unused medicines was found to be of, keeping the unused medication at home until they expired (43, 28.5%) and throwing the unused medication in the household garbage (60, 39.7%). Very few participants donated the unused medications to the hospital (3, 2%) or flushed them in the toilet or sink (15, 9.9%). Majority of the participants threw the expired medications in the household garbage (91, 60.3%) as a means of discarding them and a small number flushed the expired medication in toilet or sink (25, 16.6%) or returned them to medical stores (19, 12.6%). Handful of the people interviewed gave the expired medications to their friends or relatives (4, 2.6%) [Table 3].

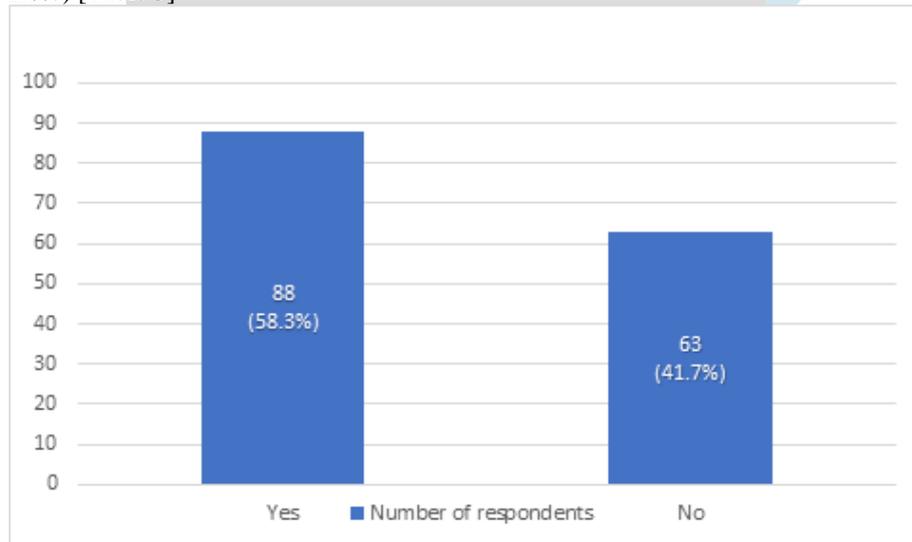


Fig.1 Response to “does any quantity of purchased medicine remain unused at your home?”

Table 3. Participants practice regarding disposal of unused and expired medicines

S.N.	Questions	n (%)
1	Donate to hospital	3 (2.0%)
	Flush unused medications in toilet or sink	15 (9.9%)
	Give to friends or relatives	8 (5.3%)
	Keep at home until expired	43 (28.5%)
	Return to medical stores	22 (14.6%)

		Throw away in household garbage	60 (39.7%)
2	What do you do with the expired medicines?	Don't know	12 (7.9%)
		Flush expired medications in toilet or sink	25 (16.6%)
		Give to friends or relatives	4 (2.6%)
		Return to medical stores	19 (12.6%)
		Throw away in household garbage	91 (60.3%)

Evaluation of Attitude

An overwhelming majority (88%) of the participants had a positive response towards; implementation of drug-take-back programs (131, 86.7%), initiation of awareness programs regarding proper disposal of unused and expired medications (131, 86.7%). A huge chunk of the population also agreed that there is lack of adequate information regarding safe disposal of unused medicines (133, 88.1%) [Table 4].

Table 4. Participants' attitude regarding disposal of unused and expired medicines

S.N.	Particulars	Positive response (Strongly agree + Agree)	Neutral response	Negative response (Strongly disagree + Disagree)
1	Unused and expired medicines present potential risks at home.	70+58=128 (84.8%)	16 (10.6%)	4+3=7 (4.6%)
2	There is lack of adequate information on safe disposal of unused medicine.	68+65=133 (88.1%)	10 (6.6%)	3+5=8 (5.3%)
3	Doctors and healthcare professionals should provide advice on safe disposal of unused and expired household medicines.	64+77=141 (93.4%)	6 (4.0%)	0+4=4 (2.6%)
4	Take-back programs of unused and expired medicines should be mandatory.	75+56=131 (86.7%)	9 (6.0%)	2+9=11 (7.3%)
5	Outreach and awareness programs about how to dispose unused or expired medicines should be initiated.	80+51=131 (86.7%)	9 (6.0%)	4+7=11 (7.3%)
MEAN TOTAL (%)		88%	6.6%	5.4%

IV. DISCUSSION

A surge in the demand for better healthcare by the people is resulting in an exponential increase in the production and consumption of medications, inevitably leading to their disposal into the environment. Many studies regarding the fate of unused and expired medications have been conducted, but majority are confined to health centers such as hospitals. To protect and preserve the ecosystem from the chemicals/biochemical substances present in the medications, it's of utmost importance to look at the bigger picture by documenting and analyzing people's attitude, awareness and disposal practices with regards to unused and expired medications. This survey was carried out with that intention in mind.

The study was a cross-sectional, questionnaire-based study which was conducted among 151 willing participants in residential areas of Hegde Nagar region of Bangalore, India. A pre-validated questionnaire was used to evaluate the knowledge, attitude and disposal practices of the participants with regards to unused and expired medications.

The majority of the population evaluated in this study were young, between the age of 25-35 years old (40.4%) and predominantly male gender (71.5%). this is similar to a study conducted in Kabul, Afghanistan [11]. All of the participants evaluated were literate (100%) with majority of the population possessing educational qualification to the level of secondary school (49.7%) or college (49%). A bigger percentage (76, 50.3%) of the population had good knowledge score even though very few knew regarding drug take back system (43, 28.5%) and medicine disposal instructions (50, 33.1%). These findings are similar to the study conducted in Northern Ethiopia where bigger percentage (180, 50.14%) of the population had good knowledge and only few (46, 12.8%) knew regarding drug take back system [3]. This maybe due to lack of established drug take back systems and awareness programs regarding proper methods of disposal of medication waste in Hegde Nagar, Bangalore.

On the other hand, a major chunk knew that improper disposal of unused and expired medicines can affect health and environment (109, 72.2%) as well as majority of them were also aware that not completing antibiotics course may cause drug resistance (88, 58.3%). These findings are similar to the study conducted in Northern Ethiopia and Eastern Ethiopia where (344, 95.8%) and (597, 86%) respectively, knew that improper disposal of unused and expired medicines can affect health and environment and (313, 87.2%) and (542, 78.1%) respectively knew that not completing antibiotics course may cause drug resistance [3,5]. This might be due to the news articles present in newspapers and channels which highlight the detrimental effects to the environment and few local pharmacists and health care professionals educating the public regarding antibiotics associated problems at the time of patient visit.

The larger part of the participants (88, 58.3%) agreed to possessing unused purchased medicines at home, this is in akin to Northern Ethiopia (52.4%) and Eastern Ethiopia (66.2%) studies [3,5]. The major practice with regards to unused medicines was

found to be throwing the unused medication in the household garbage (60, 39.7%). Very few participants donated the unused medications to the hospital (3, 2%) or flushed them in the toilet or sink (15, 9.9%). Similar trend was seen regarding disposal of expired medications, where majority of the participants threw the expired medications in the household garbage (91, 60.3%) as a means of discarding them and a small number flushed the expired medication in toilet or sink (25, 16.6%) or returned them to medical stores (19, 12.6%). These findings are similar to the results from studies conducted in Delhi, India as well as from Northern Ethiopia and Eastern Ethiopia where percentage of population which disposed expired medications via household garbage were (698, 73%), (270, 75.2%) and (369, 53.2%) respectively [2,3,5]. Presence of excess unused medications at home maybe associated with the ideology of having ready to use treatment available for various infectious diseases without the need to consult a healthcare practitioner. These results hence imply prominent presence of self-medication or self-therapy for various commonly treated illnesses. There are numerous potential risks which are involved with self-medication practices and need to be addressed, some of which include: incorrect self-diagnosis, delays in seeking medical advice when required/ in need, infrequent but severe adverse drug reactions, harmful drug interactions, incorrect method of drug administration, incorrect dosage and or choice of therapy [12]. This is also a clear indication that there exists inadequate official information with regards to the right methods of UEMs disposal among the studied population hence leading to incorrect practices being followed.

An overwhelming majority (88%) of the participants had a positive response towards; implementation of drug-take-back programs (131, 86.7%), initiation of awareness programs regarding proper disposal of unused and expired medications (131, 86.7%). This is indicating that the population is willing to make an effort towards proper disposal of UEMs under the right guidance and educational awareness if various programs and schemes are implemented. A significant proportion of the population also agreed that there is lack of adequate information regarding safe disposal of unused medicines (133, 88.1%). This further adds to the fact that the currently available information is lacking and a communication gap exists between the healthcare providers and the population with regards to the safe and proper disposal methods of UEMs. These findings are consistent with North Ethiopia study's findings on positive attitude among their population (295, 82.2%) [3].

This study's generalizability is questionable as it was conducted only in a specific region in Bangalore, India and whilst factors such as age, gender and educational qualification may influence the outcomes of population's knowledge and attitude, they may also act as confounding factors for the overall analysis of the population's behavior.

V. CONCLUSION

This survey based cross-sectional study conducted in Hegde Nagar, Bangalore, India, sheds light onto the current ongoing improper disposal practices of UEMs, and even though the general population is aware of medication waste and its harmful effects on the environment and animal life, it's still in the dark with regards to the correct practices to follow for proper disposal of UEMs. We conclude that there is a crucial need to implement a proper and functioning system to educate and guide the population towards safe disposal of UEMs by the governing body and that healthcare professionals at various levels be a part of it to carry forward the system in an efficient manner. This can be done through various programs and policies such as drug-take-back systems and awareness campaigns and drives. Lastly, it's also the duty of every person to use the medications cautiously and through proper channels as well as dispose the UEMs in a safe and effective manner so no further harm comes to the ecosystem as a result.

VI. REFERENCES

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