

Assessment of Unused and Expired Medication Disposal Practice in Gujarat

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ABSTRACT

Accretion of unused and expired medications has been extensively ignored despite its intimidating impact in both developed and developing countries. The present study was conducted to assess the knowledge, attitude, and practice of unused and expired medication disposal among the general population of Gujarat. In April 2021, a descriptive, cross-sectional study comprised of 17 pre-validated questions for the disposal of unused/expired medication was distributed through a Google form link. The study was approved by the institutional ethics committee. The population of both the gender between 18-70 was enrolled in the study. The responses obtained were authenticated for precision before analysis. The collected data were analysed by using Microsoft Excel for descriptive statistics. The data is presented in the form of percentages using tables. A total of 537 effective responses were obtained, with 46.50% female and 53.44% male participants. The most common method for disposal of unwanted and expired medication was thrown away in household garbage (59.03% and 74.48% respectively), though 53.07% of them were aware of the environmental mutilation because of the irrational way of medication disposal methods. A significant percentage of participants have stored antibiotics, pain killers, and topical agents with them. Nearly 61.63% of participants were aware of the consequences of improper disposal of medications and 63.87% suggested that proper guidance must be given to the consumer for the same through the government regulatory authorities (47.11%). The present study concluded that Improper disposal of medication waste creates an impact on the ecosystem. These findings conjure that, the strategies and define guideline has to formulate by the regulatory authorities and implemented into action to prevent further imbalance into earth life, human health and improve the handling of unused and expired medication in future among the people.

Keywords: Medication; Disposal; Expired; Gujarat

INTRODUCTION

Discovery in medical science has extremely increased the quality and life span of the human being. The astound development in the healthcare sector has been seemed by an increase in the wastage of pharmaceutical products, due to rise in increase in a number of patients who failed to complete all the medications prescribed by clinicians because of change in dose and strength, adverse event, which turns into an increase in many left-over medication and prescriptions with them [1]. Moreover, the majority of patients and families are a contributor of unused and expired medications due to non-compliance to the medication which gained attention across the world [2]. Subsequently, this pharmaceutical waste create pitfall in ecology, economy and ethics concerns which needs to be understood by every individual from all the perspective [3].

Shreds of evidence from the previous few years of literature have suggested the presence of pharmaceutical waste in groundwater,

rivers, and drinking water which is the prime reason for deleterious effects on human health. Moreover, reports suggested that the disposal of antibiotics in water causes antibiotic resistance and genetic effect in human and aquatic life in the long term which has gained national and international attention [2]. Till today, no defined guidelines have been designed by the regulatory authorities for the proper disposal of medications especially, antibiotics.

This study was thus, planned with the objective to assess and compare the current practices, attitudes towards the disposal of unused/expired medications along with knowledge about techniques of disposal especially antibiotics among the population of Gujarat.

MATERIALS AND METHODS

In April 2021, a descriptive, cross-sectional survey was conducted on the general population of Gujarat between the ages of 18 to

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70 years, irrespective of their profession. The questionnaires were designed based on a literature study. Content rationality and supremacy of questions were accomplished by specialists who were not involved in this research. The legitimacy of the feedback form was accomplished by an experienced evaluator. The study was approved by the institutional ethics committee of SAL hospital, Ahmedabad in April 2021. The study applicants were selected based on convenience sampling. A pre-tested questionnaire was then distributed through a Google form link which was sectioned into three parts: 1. Informed consent form 2. Demographic detail 3. Questions regarding knowledge, attitude, and practices related to the disposal of unused/expired medications. Open-ended questions were avoided to evade bias in interpretations and investigation. Equally, the responses collected were confidential for the unbiased result interpretation. Google form retorts were assembled for 1 month. For increasing the response rate, the students of B. Pharm final year were trained and enrolled in the survey to collect data from an urban and rural area of Gujarat. The data collection process was supervised on daily basis. The study participants were segregated into diverse groups based on their education, work profile, and income per month. The frequency and rate of responses for the overall study population and different classes were considered and equated. The responses obtained were authenticated for precision prior to analysis. The data were analysed using Microsoft Excel for descriptive statistics. As this was a cross-sectional study, no further continuation of the experiment was required.

RESULTS

All the approached 537 individuals agreed to participate in the study and none declined. Hence, the rate of participant response was 100%. Of the 537 respondents, 265 (49.34%) were of urban area whereas the other half (n=272, 50.65%) were of rural area. Two hundred and eighty-seven respondents (53.44%) were male and 250 (46.55%) were female. Maximum respondents (n=310, 57.72%) were of age 18-30 years. Two hundred and seventy-eight (51.76%) respondents were married while 245 (45.62%) were single. Nearly half of them were university graduates (n=228, 42.45%) and around one-third have completed secondary education (n=206, 38.36%). A large proportion of the respondents were students (n=148, 27.56%) and self-employed (n=143, 26.62%) following private employees, housewives, and government employees. More than half of the respondents (n=348, 64.80%) had a monthly income of more than Rs 7533 (Table 1).

Regarding knowledge about 'medical waste', a significant proportion of the respondents (n=412, 76.72%) said yes. The most common source for the knowledge of disposal of unused and expired medication was TV and other media (n=381, 70.94%) followed by the internet (n=272, 50.65%), while the pharmacist (n=117, 21.78%) as a source of information was least reported by respondents. The majority of the respondents (n=390, 72.62%) checked the expiry date of medications, before purchasing. More than half of the respondents agreed to inappropriate disposal of unused or expired medication can cause harm (n=315, 58.65%) and affect the environment and health (n=325, 60.52%). Nearly half of the respondents (n=285, 53.07%) responded that inappropriate medication disposal can contaminate the environment, whereas one-third (n=168, 31.28%) responded it can cause accidental swallow by children. A significant proportion of the respondents

agreed that providing proper guidance to the consumer could help to minimize or control the hazardous effect of unused and expired medications. Higher proportion (n=137, 25.51%) of respondents cited 1 to 5 unused/leftover medications at home. Medication for fever (n=376, 70.01%), pain (n=333, 62.01%) and antibiotics (n=287, 53.44%) were reported available at home by the majority of the respondents. A large majority of the sample (n=474, 88.26%) reported that among all the dosage forms, tablets were the most common dosage form left unused at home. A slim majority of interviewed respondents claimed doctor changed treatment (n=299, 55.67%) and self-discontinuation after condition resolved (n=291, 54.18%) were the main reasons for leftover unused medications at home. The most common pattern for disposal of unused (n=317, 59.03%) and expired (n=400, 74.48%) medications were thrown away in household garbage. Among the respondents, nearly half of the respondents (n=253, 47.11%) said that government should be responsible to create awareness for the proper disposal of unused

Table 1: Demographic characteristics of the respondents (n=537).

Variables and Categories	N	Percentage (%)
Gender		
Male	287	53.44%
Female	250	46.55%
Age		
18-30	310	57.72%
31-40	114	21.22%
41-50	55	10.24%
51-60	35	6.51%
61-70	23	4.28%
Marital Status		
Single	245	45.62%
Married	278	51.76%
Divorced	0	0%
Widowed	14	2.60%
Education		
Illiterate	10	1.86%
Primary	43	8%
Secondary	206	38.36%
Graduate	228	42.45%
Post-graduate	50	9.31%
Occupation		
Self-employed	143	26.62%
Government Employee	33	6.14%
Private Employee	116	21.60%
Housewife	97	18.06%
Student	148	27.56%
Income Per Month		
7533 and above	348	64.80%
3766-7532	29	5.40%
2260-3765	25	4.65%
1130-2259	18	3.35%
1129 and below	117	21.78%
Location		
Urban	265	49.34%
Rural	272	50.65%

Table 2: Knowledge, attitude and practice of disposal of unused or expired medication (n=537).

Questions	N	Percentage
Have you heard about medical waste?		
Yes	412	76.72%
No	125	23.27%
From which source have you heard about the disposal of unused or expired medications?		
TV and other media	381	70.94%
Internet	272	50.65%
Newspaper	161	29.98%
Doctor	144	26.81%
Friends/ relatives	136	25.32%
Pharmacist	117	21.78%
Do you check the expiry date of the medications before purchasing?		
Yes	390	72.62%
No	119	22.16%
Don't know	28	5.21%
Do you think that inappropriate disposal of unused or expired medications can cause harm?		
Yes	315	58.65%
No	45	8.37%
Don't know	177	32.96%
Do you think improper disposal of unused and expired medications can affect the environment and health?		
Yes	325	60.52%
No	34	6.33%
Don't know	178	33.14%
What is the possible harm associated with inappropriate medications disposal?		
It can contaminate the environment	285	53.07%
It can kill wildlife	84	15.64%
Can cause accidental swallow by children	168	31.28%
Are you aware of regarding consequences of improper drug disposal?		
Aware	331	61.63%
Unaware	206	38.36%
According to you, how could the hazardous effect of unused and expired medications be minimized or controlled?		
Providing proper guidance to the consumer	343	63.87%
Prescribing required quantities of medications for the duration that ensure patient compliance	299	55.67%
Lowering the quantities of prescribed medications at a time	191	35.56%
Donating or sharing the unused medications	223	41.52%
How many unused/leftover medications are available at your home?		
0	77	14.33%
1 to 5	137	25.51%
6 to 10	99	18.43%
11 to 25	120	22.34%
≥ 25	104	19.36%
Which unused/expired drugs are present at your home?		
Antibiotics	287	53.44%
Medication for fever	376	70.01%

Medication for pain	333	62.01%
Medication for headache	232	43.20%
Medication for allergy	100	18.62%
Cough medication	136	25.32%
Medication for sore throat	104	19.36%
Medication for high blood pressure	200	37.24%
Medication for diabetes	209	38.91%
Medication for diarrhoea	60	11.17%
Medication for vomiting	81	15.08%
Vitamin supplementation	82	15.27%
Topical drugs (eye drops, creams, ointments, sprays, etc)	276	51.39%
Which most common leftover dosage forms are available at your home?		
Tablets	474	88.26%
Capsules	203	37.80%
Syrups	282	52.51%
Lozenges	35	6.51%
Creams/ointments/lotions	297	55.30%
Injections	42	7.82%
Powder	81	15.08%
What are the reasons for keeping unused medications at home?		
Doctor changed treatment	299	55.67%
Prescribed more than needed	268	49.90%
Self-discontinuation after condition resolved	291	54.18%
Leftover from previous over-the-counter drug purchase	180	33.51%
Passed expiry date	235	43.76%
Adverse effect to prescribed drug	53	9.86%
Kept for reoccurring condition	126	23.46%
Did not know/sure about the purpose of medication	58	10.80%
What do you do with the unused medications?		
Throw away in household garbage	317	59.03%
Throw away outside (on the ground, in the alley, etc.)	221	41.15%
Return to medical stores	290	54%
Give to friends or relatives	113	21.04%
Donate to hospital	60	11.17%
Keep at home until expired	178	33.14%
What do you do with the expired medications?		
Throw away in household garbage	400	74.48%
Throw away outside (on the ground, in the alley, etc.)	235	43.76%
Flush expired medications in toilet or sink	95	17.69%
Burn medications	48	8.93%
Return to medical stores	81	15.08%
Give to friends or relatives	44	8.19%
Never disposed	54	10.05%
Take to a hazardous waste collection facility or collection event	30	5.58%
Who is responsible to create awareness for the proper disposal of unused and expired medications?		
Government	253	47.11%

Pharmaceutical industries	63	11.73%
Public	174	32.40%
Pharmacist	47	8.75%
Who is responsible for safe medication disposal?		
The pharmaceutical companies	65	12.10%
The pharmacies that dispense	70	13.03%
The doctors and other health care	118	21.97%
Water or wastewater treatment agencies	22	4.09%
The Environmental Protection Agency	44	8.19%
The Department of Public Health	197	36.68%
The police department	21	3.91%
Which is the acceptable method to dispose of medication?		
Rinsing down a sink	119	22.16%
Flushing down a toilet	157	29.23%
Returning to pharmacist	99	18.43%
Municipality collection at home	65	12.10%
Giving away to friends, relatives, etc.	84	15.64%
Throw in garbage	5	0.93%
Don't know	8	1.48%

or expired medications. A fairly high proportion of interviewed participants (n=197, 36.68%) reported that the department of public health should be responsible for safe medication disposal. A greater number of respondents (n=157, 29.23%) claimed that flushing down a toilet is an acceptable method to dispose of medication (Table 2).

DISCUSSION

Currently, medication disposal and management are in the spotlight which grabs the attention around the world. The current study and research have been conducted to find the solution to the above-mentioned major issue. Efforts have to be implemented by the regulatory authorities for guiding the proper method and way of disposal for unused/ expired medication to the patient. This will aid in equilibrium the earth life in terms of economy, ecology, and human health. Very few studies have been conducted to highlight this issue especially in Gujarat.

The current study found that most of the respondents heard about the disposal of unused/expired from TV, other media, and the internet. Whereas, the only smaller number of respondents reported that they have received information about the proper disposal of medical waste from the pharmacist and doctors. This is not expected as the majority of the healthcare workers do not provide proper guidance to their patients on proper disposal of medication after completing treatment [4].

In the present study, we found that a large proportion of respondents were aware of improper disposal of unused/expired medications may cause environmental harm. According to their understanding, improper disposal can contaminate the environment, can cause accidental swallow by children, and can kill wildlife. Surprisingly, though they were well aware of environmental harm, the current study shows that the common method used by the study participants to dispose of the unused/expired medication was to throw them into household garbage. This could be the prime reason for their presence in the environment and water source. This finding is matched with earlier reported reports of different

regions. The pharmacist plays a vital role in counselling the patients on rational use of medications that may improve patient adherence and reduces medication waste.

Astonishingly, the current study revealed that more than 70% of patients check the expiry date before procuring the medication from the drug store which indicates that in the present era patients are becoming proactive if they will guide in the right direction.

We found that the most common unused medication was for fever, followed by for pain, antibiotics, and topical drugs. Nearly half of the respondents had antibiotics at their homes. It's advisable to store medications for recurring symptoms at home, but keeping antibiotics and consuming without the guidance of clinicians for different infections may lead to antibiotic resistance and failure of therapeutic effectiveness [5]. The most common leftover dosage form responded was tablets, followed by creams/ ointments/lotions and syrups. Our study is in support of the study conducted by Shivaraju PT, et al. [6] and differs from the study where the syrup was the most unused or leftover dosage form the most common reasons for unused medications at home in the current study were clinicians changed the treatment and self-discontinuation after the disease condition was resolved. These findings were similar to the studies conducted by Maharana S, et al. [7]. Self-discontinuation of medications as the illness improved indicates that medications are not used correctly as prescribed by the clinicians and discontinuation of therapy in between may result in harmful consequences, predominantly resistance issue.

The study results suggest that the government is responsible to create awareness for the proper disposal of unused and expired medications, which is consistent with the study conducted by Bashaar M, et al. [2]. It is further noted that in the present study the respondents claimed, the department of public health is mainly responsible for safe medication disposal followed by the pharmacist who dispenses the medications and the pharmaceutical companies. Hence, to guide the community on proper disposal of unused/expired medications, the government, pharmacists, and pharmaceutical companies should increase awareness by providing appropriate training and conducting seminars or campaigns.

CONCLUSION

The present study brought out the unfairness in medications disposal practice was due to lack of knowledge about, and awareness of proper disposal methods of medications waste and their consequences. The establishment of national policy and legal guidelines, along with implementing awareness creation campaigns on the appropriate medications disposal practice is crucial to protect human health and the ecosystem.

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