

The Medication Pile-Up: A Cross-Sectional Study on Most Common Leftover Medicines Among Population

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Abstract

Unused and expired medications are potentially toxic and should be properly managed to prevent environmental hazards. Proper disposal of medicine is a widely recognized challenge that has garnered increasing attention in various settings. Insufficient knowledge about the proper methods for disposing of unused medication can lead to serious consequences, including the accumulation of chemical compounds and hazardous substances in the environment, accidental overdoses, and the potential for prescription drug misuse.

Prescribed drugs often go unused due to various circumstances, such as changes in treatment plans, adverse reactions, improvements in patients' health, or other contributing factors. According to the World Health Organization (WHO), a significant number of pharmaceuticals have been improperly prescribed or made available for sale. This has resulted in the accumulation of vast amounts of solid waste from expired and unused medications, creating a substantial environmental burden related to the disposal of these pharmaceutical substances. Non-steroidal anti-inflammatory drugs are among the most frequently wasted medications, and most of the public just dispose of their expired medications in the trash or toilet. Non-adherence, death, and medication change are among the main causes of medication accumulation and consequent wastage. A lack of policies to return unwanted medications in some countries, as well as public unawareness, carelessness, or illiteracy, are reasons for improper disposal of unused medications that may lead to adverse economic and environmental impacts.

This review aims to evaluate the distribution of practice on the number of expired/unused drugs at home and distribution of classes of unused/expired drugs at home among general population in Eraviperoor Grama Panchayath, Kerala, India. This is a descriptive cross-sectional survey conducted among 800 participants in Eraviperoor grama Panchayath, Pathanamthitta, Kerala. Institutional Ethics Committee approval was obtained and the data were collected using a pre-validated questionnaire. Most of the participants possessed unused / expired medications in their home.

Keywords: Unused Medications, Expired Medicines

Introduction

Medicines are essential for the diagnosis, prevention, and treatment of numerous diseases and medical conditions⁽¹⁾. It has been documented that more than half of all medications are inappropriately prescribed

or dispensed globally, and only 50% of patients take their medication as directed. Medication adherence is even lower in developing countries⁽²⁾. Unwanted or unused and expired medicines are piling up in homes and ending up in landfills, sewers, streams, and water supplies. Prescription drugs accumulate in households often due to patient non-adherence, improvement in treated conditions, and medication discontinuation resulting from changes in dose, drug expiration, and patient deaths. However, the main reason for the increasing volume of unwanted or unused and expired medicines is self-discontinuation by people⁽³⁾.

Home medicine cabinets contribute to prescription drug abuse and the drug overdose epidemic. Previous studies have revealed that the majority of people dispose of unwanted, unused, and expired medicines in toilets or sinks. Consequently, this practice can directly impact public safety and pose environmental hazards⁽⁴⁾. Insufficient knowledge about how to properly dispose of unused medication can result in serious consequences, including the buildup of harmful chemicals in the environment, accidental overdoses, and the potential for prescription drug misuse⁽⁵⁾. To ensure the effectiveness and safety of pharmaceutical products, it is important to adhere to the storage conditions specified on the label and use them before their expiration date⁽⁶⁾. Pharmaceutical disposal is often recommended by suppliers and certain healthcare organizations, particularly in relation to their expiration date. This is mainly because expired medications can degrade, leading to reduced effectiveness or potentially harmful effects⁽⁷⁾. Prescribed medications frequently go unused due to various factors, such as changes in treatment plans, adverse reactions, improvements in the patient's condition, or other contributing reasons. The World Health Organization (WHO) reports that a significant amount of pharmaceuticals has been improperly prescribed or sold, leading to the accumulation of large volumes of solid waste from expired and unused medications. This creates a considerable environmental burden associated with the disposal of these substances⁽⁸⁾.

The Food and Drug Administration (FDA) in the United States has issued guidelines for the proper disposal of leftover pharmaceuticals. According to these guidelines, the best way to dispose of unneeded or expired medications is to take them to certified drug take-back locations, which are often found at medical institutions such as retail pharmacies and health centers⁽⁹⁾. Additionally, it is important to recognize that certain medications can be safely disposed of by flushing them down the toilet, provided they are listed on the FDA's approved roster for this method. This list includes various opiates such as buprenorphine, morphine, other opioid derivatives, as well as diazepam and methylphenidate⁽¹⁰⁾. On the other hand, medications that are not suitable for disposal by flushing should be mixed with an unappealing substance, like dirt, cat litter, or used coffee grounds. Afterward, they should be securely placed in a sealed plastic bag and disposed of in the designated waste receptacle⁽¹¹⁾. Research on the knowledge and attitudes of the general population toward the disposal of expired and unused medications has been conducted in various regions worldwide. However, the specific knowledge and attitudes of certain populations regarding the safe disposal of these drugs remain unclear. This gap in understanding is largely due to the lack of a regulatory authority system that governs the proper handling of expired and unused medications at the household level.

Objective

The objective of this study is to assess the most common leftover drugs among the population.

Materials & Methodology

A descriptive cross-sectional study was conducted in Eraviperoor Grama Panchayath and Thiruvalla Municipality in Pathanamthitta District from November 2022 to April 2023. The study included individuals aged 18 to 80, excluding those who were unable to provide responses. Written informed consent was obtained from participants who agreed to take part in the study. Approval was granted by the Institutional Ethics Committee, Faculty of Pharmacy Practice, Nazareth College of Pharmacy, Othara, Pathanamthitta.

Data was collected using a structured Questionnaire which has been validated.

Questionnaires were filled through face-to-face interviews with patients and data were collected.

The sample size has been calculated by using the formula:

$$\frac{Z^2 \times P(1+P)}{e^2} \div \left(1 - \frac{Z^2 \times P(1+P)}{e^2 N} \right)$$

Where,

P = Standard deviation

N = Population size

E = Margin of error

Z = 95% Confidence interval of Z²

Results

A total of 800 people participated in this study in which majority were males (n=440) and majority were aged between 40 to 60 (n=356).

Table 1: Demographic details of the participants.

SL NO	DEMOGRAPHIC PARAMETERS	CRITERIA	PERCENTAGE
1	AGE	18-40	35.74 %(286)
		40-60	44.50%(356)
		>60	19.76%(158)
2	GENDER	Male	55%(440)
		Female	45%(360)

Table 2: : Distribution of practice on the number of expired/unused drugs at home

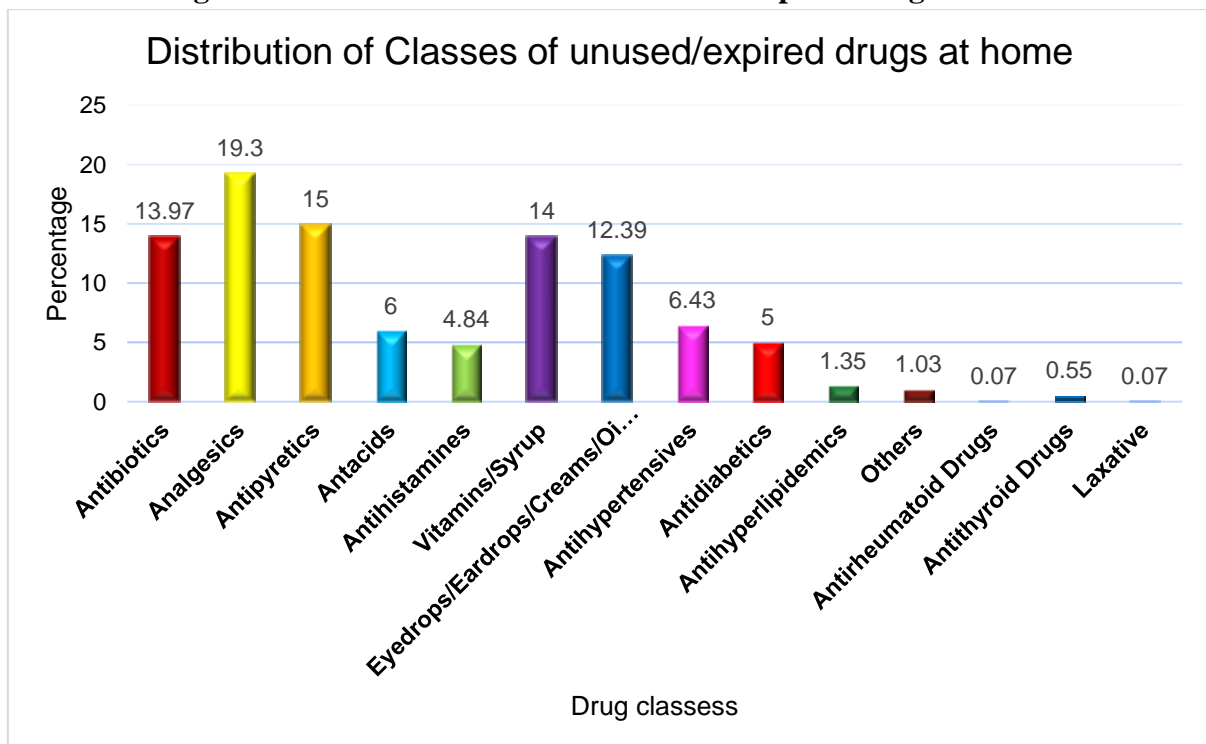
SL NO	RESPONSE	FREQUENCY	PERCENTAGE
1	1-5	691	91.16
2	>5	67	8.84
	Total	758	100

Out of 800 participants , 91.16% of people possessed 1-5 number of unused/expired medicines at home and 8.84 % of people possessed more than 5 number of medicines at home.

Table 3: Distribution of classes of unused/expired drugs at home

SL NO:	Class of drugs	Frequency	Percentage
1	Antibiotics	176	13.97
2	Analgesics	243	19.3
3	Antipyretics	186	15
4	Antacids	79	6
5	Antihistamines	61	4.84
6	Vitamins/Syrup	170	14
7	Eyedrops/Eardrops/Creams/Ointments	156	12.39
8	Antihypertensives	81	6.43
9	Antidiabetics	68	5
10	Antihyperlipidemics	17	1.35
11	Others	13	1.03
12	Antirheumatoid Drugs	1	0.07
13	Antithyroid Drugs	7	0.55
14	Laxative	1	0.07
	Total	1259	100

Figure 1: Distribution of classes of unused/expired drugs at home



In a population of 800, participants were categorized into 14 groups based on the types of unused or expired drugs they had at home. The distribution was as follows: 243 participants had analgesics, 186 had antipyretics, 176 had antibiotics, 170 had vitamins or syrups, 156 had eyedrops, eardrops, creams, or ointments, 81 had antihypertensives, 79 had antacids, 68 had antidiabetics, 61 had antihistamines, 17 had antihyperlipidemics, 13 had other drug classes, 7 had antithyroid drugs, 1 had anti-rheumatic drugs, and 1 had a laxative.

Discussion

In the study conducted among 800 participants, 44.50% belong to the age group 40-60 and only 19.76 % belong to the age group >60. In this 360 participants were females (45%) and 440 participants were males (55%).

Majority of the participants (91.16%) had about 1-5 unused or expired drugs in their home, followed by 8.84% possess more than 5 drugs. This is contrast to the study conducted by Kumar *et al.*, where majority of them had more than 5 unused/expired medicines while only 37.9% had 1-5 drugs.

In the current study, regarding the class of drug possessed by the participants, 243 participants (19.3%) possessed analgesics, followed by 186 participants (15%) possessed antipyretics and 176 participants (13.97%) possessed antibiotics. This is contrast to the study conducted by Padmanabha Thiruganahalli *et al.*, where 64% of participants possessed eye drops and ointments.

Conclusion

Out of 800 population, which included more number of males and those between 40 to 60, 691 (91.16%) people possessed 1-5 number of unused/ expired medicines in their home. Also 243 participants possessed analgesics, 186 participants possessed antipyretics and 176 participants possessed antibiotics followed by possession of vitamins, syrups, eye drops , ear drops etc. Above results indicates that most of the population were unaware of the hazards of possessing unused or expired medications and also most of the population possess analgesics, antipyretics and antibiotics at home due to poor adherence , over use and improper use of medicines. The study also concludes that a proper system to collect unused/expired medicines is needed in this country.

List Of Abbreviations

WHO - World Health Organization

FDA - Food and Drug Administration

IEC – Institutional Ethics Committee

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