

# Study on Drug Usage, Storage and Wastage Among Households in Chengalpattu, Tamil Nadu, India - A Cross-Sectional Study

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## ABSTRACT

**Background:** Improper drug storage is immensely prevalent in households. A significant number of families do not follow prescribed practices for maintaining the safety and efficacy of medications. Increased rates of unintentional poisoning, decreased drug efficacy, and the emergence of antibiotic resistance are just a few adverse consequences that might result from such negligence.

**Methodology:** A total of 213 households were selected using multi-stage random sampling techniques. A pre-tested structured questionnaire on drug storage, usage, wastage in the households was used and detailed interview was conducted with the participants.

**Results:** Majority of the participants 56.3% (120) belonged to the age group of 30- 40 years, most of the participants are graduates 39.4% (83). The prevalence of self-medication was 30.5%. Safe storage conditions with appropriate packing were used by 81.5% (167) of people. About 69.9% (149) has good knowledge on correct dosage of medications. 91.2% (187) of households discard unused medications in the garbage. Commonly stored medicine was analgesics and antipyretics 21.6% (86). In this study Increasing age, Education and Family with senior citizens above 60 years have a strong association with storage condition of medicines at home.

**Conclusions:** This study shows 96.3% prevalence of in-home storage medication practices. Ensuring the efficacy, safety, and cost-effectiveness of medications requires proper management from storage to use and waste prevention.

**Keywords:** Storage, Drug usage, Wastage, Household, Self Medication

## ARTICLE INFO

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## INTRODUCTION

Overuse of medications is a significant issue on a global scale. According to WHO estimates, half of patients do not take their medications as recommended and over half of all medications are improperly sold, administered, or prescribed. Misuse, abuse, or overuse of medications wastes limited resources and poses a public health risk.<sup>1</sup>

Medication waste is caused by a number of factors, including low patient adherence to treatment, excessive physician prescribing, early treatment of medical diseases, and changes in treatment plans.<sup>2</sup>

In India, the general public does not know how to dispose of unused and expired medications. A conceptual framework for the disposal of unused and date-expired medications is developed.<sup>3</sup>

Keeping a lot of medication in storage at home raises the possibility of several drug-related issues, such as mistakes made when taking prescriptions, poisoned by accident, resistance to antimicrobial agents' adverse medication responses, sharing of medications, drug misuse and waste of resources.<sup>4</sup>

Regular prescription monitoring and drug usage research can close the gaps and provide a foundation for beneficial remedies. Because poor nations have limited resources for healthcare and drug supplies, prescribing medications wisely is essential to maximizing available resources.<sup>5</sup>

It has been estimated that about 60–80% of health problems are treated by self-medication.<sup>6</sup>

According to the WHO (2011), unused medication that is returned to the pharmacy unopened must usually be disposed of, wasting potentially useful medication. A shift toward a sustainable method of producing, distributing, prescribing, dispensing, and using medication is required to limit the issue of drug waste.<sup>7</sup>

In order to treat acute or chronic illnesses and for emergencies, medications are kept in stock in the home. The stability of medications may be impacted by incorrect drug storage. Medication that was kept at home was taken by someone other than the patient for whom it was prescribed. It detailed the widespread usage of dietary supplements and over-the-counter drugs. Large drug storage volumes at home might result in drug-related issues such as adverse drug reactions (ADRs) and prescription errors.<sup>8</sup>

In addition to having a direct effect on public health, the environment, and healthcare systems, improper handling and storage of pharmaceuticals at home can increase the risk of self-medication. Improper home medicine storage is a global problem that leads to drug waste and has detrimental effects.

Additionally, unused prescription drugs may build up in the home as a result of therapy termination due

to a patient's poor response, a doctor's change of their treatment, or patient death.<sup>9</sup>

The study was conducted to assess the drug usage, storage and wastage among households and to determine the factors associated with home storage of drugs.

## METHODOLOGY

A community-based, cross-sectional study was conducted in Maraimalai Nagar, Chengalpattu district during August 2024 to October 2024 to evaluate storage, reuse, and disposal of unused medications by general households. Based on the study of Nazima Mirza et al<sup>10</sup> the medicines available in household was 93.75% and left over medicines available in household was 33.76% and the average of two was taken, (P - 63.75%) is used to calculate sample size. Sample size of 181 is obtained using formula  $n = Z^2pq/d^2$  with 7% allowable error. With a non-response rate of 10%, Sample size was rounded off to 200. The household informant who are a permanent resident, and willing to participate in the study were included in the study. The household informant having some illness due to which he/she cannot recollect or remember the information or does not understand the questions and who were not willing to participate were excluded from the study.

Multi stage random sampling method was used. There are 8 wards in Maraimalai Nagar, out of which 3 wards (Gandhi Nagar, Peramanur and Kattankulathur) were randomly selected because of feasibility reasons. Single participant who satisfied the study criteria were included in the study. Then, from the selected ward, through probability proportionate to size depending on the population size, required samples are selected from each of the study area. In order to offer equal importance to all eligible age groups, if more than one eligible respondent is available in the chosen home, one respondent was chosen by the lottery method. In the event that a house failed to meet the requirements, participants declined to provide their consent, or the house was locked for three consecutive visits, the next house was selected for the study. Following institutional ethical committee clearance, the data collection was started. Each individual was interviewed face to face. The interview was conducted by single interviewer to avoid inter-observer bias. The purpose of the study was explained to the study participants, confidentiality was ensured and finally, members of 213 households who had given consent were included in the final survey. For children under the age of 18 years, with the help of parent's interview was conducted. Data collection was done using Questionnaire according to the modified WHO Household Survey to Measure Access to and Use of Medicines Long Version<sup>11</sup> and to validate, it was pretested on 20 households in similar households. There were two parts in the questionnaire: a) Sociodemographic

information, the origins of different substances, and the motivations behind drug stockpiling at home were collected, b) Information was also collected regarding the specifics of each medication, including its name, label, packing, expiration date, storage condition, and disposal plan for any unused medication items. Good knowledge refers to the correct dosage of medicines and safe storage practices refers to drugs stored in medicine box, drawer, cupboard separately.

Data was coded and verified for accuracy and consistency. The data collected are entered into Microsoft Excel spreadsheet and analyzed using IBM SPSS version 26.0. Descriptive tables were used for the socio-demographic details of the patients, Chi-square test was used to find the association between the study variables.

## RESULTS

Out of the 213 households, 8 (3.7%) did not store any medicines at all.

There are more men (53.5%) than women (46.5%) in our study. In terms of age, the biggest percentage of responders (34.2%) of the sample as a whole are between the ages of 30 and 40 years, followed by those between the ages of 40 and 60 years (22.1%). The majority of responders (39%) are graduates, (10.2%) of study participants are illiterate. In terms of socioeconomic status, the majority of respondents belong to the upper class (44.6%) followed by upper middle class (30.6%). (Table 1)

The majority of respondents (70.2%) knows a lot about the medications that are kept in their homes. When it comes to storage conditions, (81.5%) of people keep medications safely, demonstrating a strong commitment to safe storage standards. (71.7%) of respondents stores medicines with improper labelling, which may cause misunderstanding or misuse of medicines. (91.2%) of people discards unused medicines in garbage.

Labelling and disposal procedures may need some work, but overall awareness and safe storage techniques are strong. (Table 2)

Analgesics and antipyretics make up (21.6%) of all medications, followed by (13.5%) of antihistamines, (11.4%) of digestive remedies. Antibiotics comprise a mere (5%) and these are expected to be used in the future. Whereas chronic treatment demands are reflected in the Ongoing use of Anti-hypertensive, Anti-diabetic medications and Vitamin supplements which make up (11.0%), (7.0%) and (12.0%) of the total, respectively. (Table 3)

Figure 1 shows the usage of stored medicines in households.

The information provides insights into how various demographic groups store medications at home.

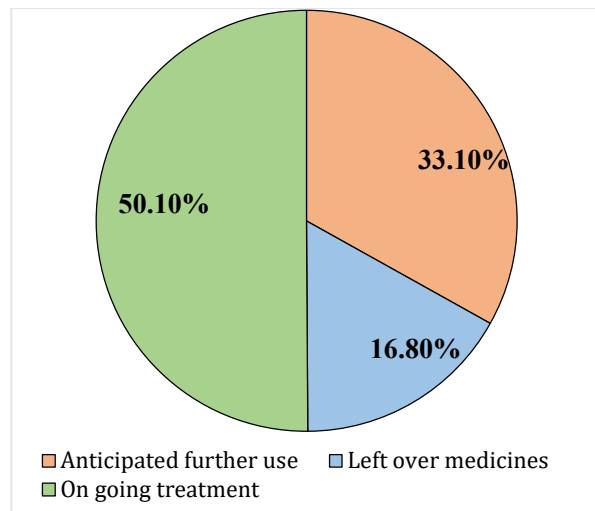


Figure 1: Use of stored medicines in households

Table 1: Socio-Demographic Characteristics of Households (n=213)

Characteristics	Respondents (%)
<b>Gender</b>	
Male	114 (53.5)
Female	99 (46.5)
<b>Age</b>	
<18 years	34 (16)
18 - 30 years	29(13.6)
30 - 40 years	73 (34.2)
40- 60 years	47 (22.1)
> 60 years	30 (14.1)
<b>Educational Level</b>	
Graduate	83 (39)
Secondary school	69 (32.5)
Primary school	39 (18.3)
Illiterate	22 (10.2)
<b>Socio Economic Class*</b>	
Upper	95 (44.6)
Upper middle	65 (30.6)
Middle	32 (15)
Lower middle	21 (9.8)

\*Modified BG Prasad Scale 2024 is used to calculate Socio Economic Status<sup>12</sup>

Table 2: Knowledge and Storage of medicines in Household (n=205)

Variables	Frequency (%)
<b>Knowledge about medicines stored</b>	
Good	144 (70.2)
Bad	61 (29.8)
<b>Storage condition</b>	
Safe	167 (81.5)
Unsafe	38 (18.5)
<b>Labelling of medicines</b>	
Proper labelling	58 (28.3)
Improper labelling	147 (71.7)
<b>Disposal of unused medicines</b>	
Throw them	187 (91.2)
Keep them	18 (8.8)

A ( $\chi^2$ -0.95, P-value-0.33) indicate that there is no significant correlation between age and safe medica-

tion storage, with (40.8%) of respondents over the age of 18 years storing medications safely. Again, demonstrating no significant correlation, (35%) of graduates keep medications safely, whilst (65%) do not ( $\chi^2$ -1.22, P-value-0.27). There is no significant difference between the (35.2%) of families with children under the age of 18 years who report safe storage and the (64.8%) who report unsafe storage ( $\chi^2$ -0.30, P-value-0.58). A similar pattern is seen in families with elderly adults 60 years of age and older, with (33.3%) keeping medications safely and (66.7%) storing them unsafely ( $\chi^2$ -0.95, P-value-0.33), with no significant correlation.

There is a statistically significant correlation between age and safe storage conditions of medicines at home, with (78.8%) of respondents over the age of 18 years reporting safe circumstances. Safe circumstances are maintained by (72.2%) of graduates, with a substantial correlation ( $p < 0.001$ ). (85.2%) of families with children exhibit safe storage conditions; nevertheless, this is not a statistically signifi-

cant result (P-value-0.07). Safe circumstances are ensured by (73.3%) of families with older citizens, with a substantial correlation ( $p < 0.001$ ).

(69.3%) of respondents over the age of 18 years check expiry dates before taking prescriptions, compared to (30.7%) who do not; nonetheless, the difference is not statistically significant (P-value-0.294). (65%) of graduates look up expiration dates, although the results are not statistically significant (P-value-0.779). While there are no significant correlations (P-value-0.554 and P-value-0.2068, respectively), (70.5%) of families with children and (50%) of families with senior citizens mention checking expiration dates.

Overall, while safe storage conditions of medicines at home shows significant associations among adults, graduates, and families with seniors, whereas no significant differences emerge for Storage places or expiry date-checking practices across the groups analysed. (Table 4)

**Table 3: Categories of medicines and utilization status found in household**

Categories	Anticipated Further Use	Left Over Medicines	On Going Medicines	Total (%)
Analgesics/antipyretics	48	28	10	86 (21.6)
Antihistamines	34	12	8	54(13.5)
Antibiotics	-	5	15	20(5.0)
Digestive remedies	24	14	7	45(11.4)
Anti-hypertensive drugs	-	-	44	44(11.0)
Anti-diabetic drugs	-	-	28	28(7.0)
Vitamin supplements	8	-	40	48(12.0)
Others	18	8	48	74(18.5)

**Table 4. Factors associated with home storage of medicines**

Medicine Storage	Age (18 years & above) (n=179)	Educational Status (Graduate) (n=83)	Family with children (< 18 years) (n= 34)	Family with Senior Citizens ( $\geq 60$ years) (n=30)
<b>Storage place for medicines at home (n=205)</b>				
Safe (81)	73 (40.8%)	29 (35%)	12 (35.2%)	10 (33.3%)
Unsafe (124)	106 (59.2%)	54 (65%)	22 (64.8%)	20 (66.7%)
Chi square	0.95	1.22	0.3	0.95
P value	0.33	0.27	0.58	0.33
<b>Storage condition of medicines at home (n=205)</b>				
Good (167)	141 (78.8%)	60 (72.2%)	29 (85.2%)	22 (73.3%)
Poor (38)	38 (21.2%)	23 (27.8%)	5 (14.8%)	8 (26.7%)
Chi square	0.0055#	24.85	3.19	23.03
P value	<0.001 #	<0.001*	0.0739	<0.001*
<b>Check for expiry date before usage of medications (n=213)</b>				
Yes (141)	124 (69.3%)	54 (65%)	24 (70.5%)	15 (50%)
No (72)	55 (30.7%)	29 (35%)	10 (29.5%)	15 (50%)
Chi square	4.74	0.078	0.348	1.59
P value	0.294	0.779	0.554	0.2068

\*p-value <0.05 shows statistically significant; #Fishers exact test was done

## DISCUSSION

As over-the-counter (OTC) medications become more accessible and the number of chronic conditions requiring frequent prescription increases, there is growing concern about the ubiquity of medicine storage in homes in many countries. Improper storage methods, such as putting pharmaceuticals in are-

as that are too hot, humid, or exposed to sunlight, are a major problem with medicine storage in homes and can lower the effectiveness of prescriptions. One source of waste is medications that are not utilized before they expire. Unused or expired prescriptions are frequently accumulated by households without the members knowledge that they are no longer safe or effective.

In this study, out of 213 households, 96.3% stored medicines at home; this is similar to the prevalence of the study by S. Suryawanshi et al.<sup>13</sup>, with 100% among the study participants. The similarities may be due to difficult in access to healthcare facilities, easy availability of over-the-counter medicines, might influence the high prevalence of medicine storage.

In a study by Aumrin Fathima<sup>14</sup> et al 77.8% belonged to the 30-60 years age group and 57% were male which is similar to our study where males were predominant 53.5% but age group belonging to 30-60 years were 56.4% which is on a lower side in this study. As the other study mainly focused on a specific demographic or occupational group that naturally skews toward certain age group.

In the current study, 39% of the population were graduates, while 10.2% were illiterate. A study by Y. Sravan Kumar et al<sup>15</sup>, showed that 42% of the population lacked literacy, a figure that appears to surpass our findings. This difference may be due to the fact that this study is conducted in urban area, where literacy rate is higher. In our study, the prevalence of self-medication was 30.5%, while other studies by Dnyanesh Limaye et al<sup>16</sup> shows prevalence of self-medication with 92.8% in the urban area of Delhi and by Pragati Rathod et al<sup>17</sup> the prevalence of self-medication in central delhi was 60% which was found to be very high when compared to our study, as this may be practised in order to save time and money by not contacting a healthcare provider, many people choose to self-medicate. Similarly, a study by Aumrin Fathima Johnbasha et al<sup>14</sup> in Pudhucherry found the prevalence of self-medication was 11.9% which was less when compared to our study.

In a study in Chithoor by Y. Sravan Kumar et al<sup>15</sup> (73%) of the stored medicines had adequate labelling, but in our study, only (27.2%) of stored medicines had proper labelling. This may be due to the fact that there is no standard for labelling medicines, and individuals may not know what should be included on a label (such as the drug name, dosage, expiration date, and storage instructions). Especially with medicines that have similar appearances, improper labelling could cause accidental overdoses.

Medicine wastage happens when prescriptions are not used as prescribed by doctors, because they are unused, expired, or improperly maintained. This can have a number of negative effects, such as harm to the environment and needless medical expenses. In a study by Rosme David et al<sup>18</sup>, the most common method of medicine disposal was through regular garbage disposal (58.2%), but when compared to our study, it shows an increase in the trend, which is around (91.2%) which may be due to lack of awareness about disposal of drugs among the study participants.

Based on the Pandey Shantanu Deviprasad et al<sup>19</sup> study, the most common drugs found in households were antihypertensives (46%), and antidiabetics

(39%), but in our study, the most commonly stored medicine is analgesics and antipyretics (21.6%) which is similar to a study by Abhishek Sharma et al<sup>20</sup> where commonly stored medications included analgesics/anti-pyretic (28.07%). In a study by Jaya Lalwani et al<sup>21</sup>, 17.9% of the antibiotics are stored in households whereas in current study it is only 5%; this shows a positive outcome among the increasing trends of antimicrobial resistance.

In our study, increasing age, Education and Family with senior citizens above 60 years have a strong association with Storage condition of medicines at home, which is similar to a study by Adineh Jafarzadeh et al<sup>22</sup> income, education, age and female gender were found to be associated with home storage condition of medicines.

## LIMITATIONS

Given that those being interviewed were fully aware of the project's goal, some information about medications was withheld, which could have distorted the results. Nevertheless, this restriction does not emphasize how significant the findings are. The findings observed from the study, at minimum, include the references for further research of a similar nature, while offering the baseline data for upcoming comparisons.

## CONCLUSION

Home storage of medicine practices seems to be high with 96.3%. So, to overcome this in India, guidelines should be provided for improving supply chain management, increasing awareness, implementing regulatory measures, development of a standard for labelling medicines should be implemented and awareness about the importance should be done among general public.

**Approval of Institutional Ethical Review Board:** Institutional Ethics Committee, SRMIEC-ST0724-1442

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analysis, and manuscript preparation; **VVA**: Involved in study conception, data analysis, and manuscript preparation; **KR**: Involved in study conception, design, data analysis, and manuscript preparation.

**Availability of data:** The data that support the findings of this study are available from the corresponding author on request.

**Non-Use of generative AI -** No generative AI tools were used to prepare this manuscript.

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