



The magnitude and associated factors of unused medications storage practice among households in Jimma city, southwest of Ethiopia: Community-based cross-sectional study

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ABSTRACT

Background: Medicines are kept unused at home for many therapeutic reasons. Conversely, unused medication and subsequent wastage can be attributed to several primary factors such as medication change, death, and non-adherence. This study aimed to assess the magnitude and associated factors of unused medication storage practice among households in Jimma City, southwest Ethiopia.

Methods: A community-based cross-sectional study design was conducted among households ($n = 397$) in Jimma Town from July to August 2021. The data were collected using the pre-tested and interviewer-administered questionnaire. SPSS version 21.0 was used for data analysis. The multivariate logistic regression was used to determine the factors associated with the storage of unused medicine at a 5% level of significance.

Results: Out of 397 households that responded, ($n = 90$, 23%) of households were found to have unused medicine at home. This study showed that the majority of households dispose of unused drugs by burning them (32.2%) and burying them in the ground (29%). Antibiotics were the most (6.3%) unused medicines stored while the anti-diabetics (1.3%) were the least unused drugs stored among households. The presence of family members working in the health sector (AOR: 0.402, 95% CI: 0.202, 0.800) and family size in households (AOR: 2.325, 95% CI: 1.045, 5.174) were significantly associated with the magnitude of unused medicine storage.

Conclusion: The magnitude and improper disposal of unused medicines storage among households were significant in the study area. Therefore, it is important to educate the community and encourage health professionals to understand their role in problems and solutions.

1. Introduction

Medicines serve a crucial role in healthcare, even though they are overused or unused. Unused medicines are any pharmaceutical products that are not fully consumed, whether prescription or over-the-counter drugs that can arise from households or health-care activities. These medications are commonly intended for future use or are expired, discontinued, deteriorated, or otherwise constitute a large part of household storage practice, which poses a risk to public health and the environment.^{1,2} The variety of treatment discoveries for various health problems has increased over the last few decades, reshaping patient care approaches in many parts of the world, and associated spending has become higher than the previous forecasts.^{3–5} Instead, the prevalence of

unused drugs being disposed of in the garbage or toilets of households has increased significantly over the past decades. The improper disposal of unused medicines is attributed to factors such as non-adherence, death, medication change, lack of return policy, public unawareness, carelessness, and illiteracy.⁶ In the United States, nearly two out of three medications are unused due to improved illness, amnesia, and adverse events.⁷ These unused medicines were pain relievers, antibiotics, medications for chronic conditions, and antipsychotics with a total estimated cost of \$59,264.20. In India, each family had 16.3 drugs at home, most of which are antihypertensive and anti-diabetics available in solid dosage form.⁸ Similarly, in Pakistan, unused medicine subsists almost in every home and in any form.⁹ A study in North-Western Ethiopia revealed that 13.8% of unused drugs were found in the community, with

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anti-infectious drugs being the most consumed.¹⁰ In the town of Gondar, Northern Ethiopia, 44.2% of the drugs stored and dispensed for infectious diseases, digestive systems, metabolic systems, and cardiovascular systems were stored in drawers.¹¹ In addition, in north-eastern Ethiopia, 1.73 medicines were stored per family, mainly in urban areas.¹² Addressing the issue of unused medication requires targeting various stakeholders, including the general public, healthcare providers, and governments, as they are all implicated in different ways and accused of contributing to the problem.³ Unused medication practices differ across countries by location and time, where measuring the storage and practice of unused medication is essential to safeguarding lives and protecting the ecological system.^{12,13} Thus, this study aimed to evaluate unused medicine storage practices and associated factors among households in Jimma town, southwestern Ethiopia.

2. Methodology

2.1. Study design, period, and setting

A community-based cross-sectional study design was conducted among households ($n = 397$) in Jimma Town from July to August 2021. Jimma Town is the capital of the Jimma Zone of the Oromia Regional State, located 350 km away from Addis Ababa (the Capital city of Ethiopia) in the southwest of Ethiopia.¹⁴ By 2023, Jimma Town had a total population size of 2,870,318. Of these, 1,436,172 were men and 1,434,145 were women.¹⁵ It covers an area of 15,568.58 km² in which 13 Kebeles are dwelling currently.

2.2. Sample size and sampling technique

For the determination of the sample size, the Raosoft sample size calculator was used.¹⁶ In a previous study, 13.8% of households had stored any unused medicines.¹⁰ Thus, using $p = 13.8$, a 95% confidence interval with a 5% margin of error, the power of 0.8, and taking the design effect of 2 and allowing a 10% non-respondent rate, the total calculated sample size was 402. Considering the homogeneity of the population, 4 of 13 kebeles ($\approx 31\%$) were selected from Jimma Town by simple random sampling technique. From the total of 45,126 households in Jimma Town,¹⁷ the numbers of households sampled from the selected kebeles (13,885) were allocated proportionally to their size, and the specific households were selected using simple random sampling techniques.

2.3. Data collection process

The tool for data collection was adapted from previous works of literature^{10,11,18}, and face validity as well as readability was examined by four experts, focusing on making the questionnaire easier for the general public to understand. Translation of the questionnaire was made from an English version to local languages (Afaan Oromo and Amharic) and back reversed to English languages for the sake of consistency. Before starting the real study, the pre-test was carried out on a 5% population to check the acceptability and consistency of the data collection tool. The actual data were collected by interviewing the head of the household. Data regarding sociodemographic information, characteristics of unused medicines, disposal methods, and information on medicines available in the households were collected.

2.4. Data processing and analysis

All the filled questionnaires were checked to ensure their completeness before they were manually entered into the Statistical Package for Social Science (SPSS) version 21.0 (Chicago, SPSS Inc.). The results were summarized by using frequencies and percentages. To check the association between dependent and independent variables, bivariate logistic regression was employed. Then, for factors that

showed a significant association ($p < 0.05$), multivariate logistic regression was followed to determine the strength of association between variables at a 5% level of significance.

3. Results

3.1. Socio-demographic characteristics of study participants

Out of 402 heads of the household included in the study, 397 participants responded to the interview with a response rate of 98.8%. The majority, ($n = 252$, 38.3%) were in the age category of 41–50 years. The proportion of female participants ($n = 247$, 62.2%) was higher than males ($n = 150$, 37.8%). Most of the householders were farmers ($n = 159$, 40.1%), and had the highest education level of primary school ($n = 114$, 28.7%) with a family size of ($n = 176$, 44.3%). The household income of most households was 1501 to 2500 ETB ($n = 124$, 31.2%). Out of the total households, ($n = 100$, 25.2%) had family members working in health facilities and ($n = 175$, 44.1%) had health insurance coverage (Table 1).

3.2. Magnitude and disposal practice of unused medicines

Out of 397 respondents, ($n = 90$, 23%) of households were found to have unused medicine at home (Fig. 1). This study indicated that most of the households dispose of unused drugs by burning medicines ($n = 128$, 32.2%), and bury in the ground ($n = 115$, 29%) (Fig. 2).

Table 1
Characteristics of study respondents and their households.

Variables	Frequency (n = 397)	Percentage (%)
Gender of respondents		
Male	150	37.8
Female	247	62.2
Age of respondents		
18–30	60	15.1
31–40	144	36.3
41–50	152	38.3
>50	41	10.3
The highest educational level in the household		
Can write and read	99	24.9
Primary school	114	28.7
Secondary school	87	21.9
College	69	17.4
Degree and above	28	7.1
Occupational status of household head		
Government Employee	68	17.1
Farmer	159	40.1
Private Employee	104	26.2
Laborer	38	9.6
Other	28	7.1
Number of family members		
<3	140	35.3
3–5	176	44.3
>5	81	20.4
Monthly income of the household head		
<500 ETB	102	25.7
500–1500 ETB	117	29.5
1501–2500 ETB	124	31.2
>2500 ETB	54	13.6
The family member in your family working in the health sector		
Yes	100	25.2
No	297	74.8
Insurance coverage		
Yes	175	44.1
No	222	55.9

Abbreviation: ETB, Ethiopian Birr.

Do you have any unused medicine at home?

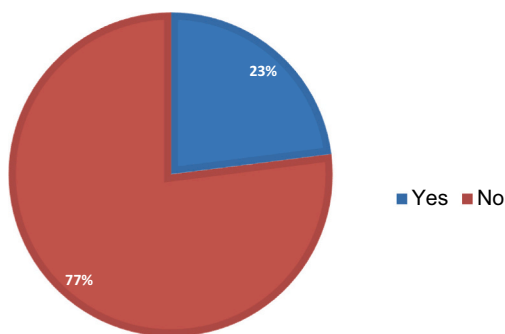


Fig. 1. Prevalence of unused medicine storage among households.

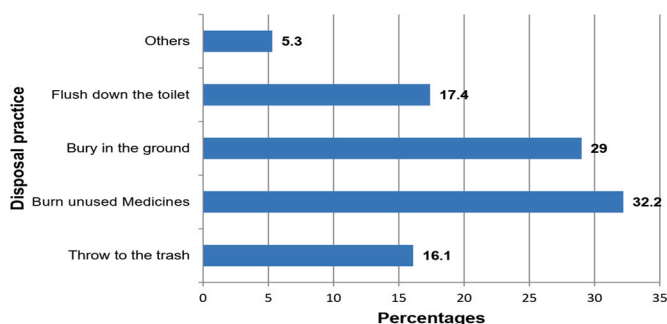


Fig. 2. Disposal practice of unused medicine among households. Abbreviation: GIT, Gastrointestinal tract.

3.3. Characteristics of unused medicines in households

Unused medicines were stored among households when consumers were relieved from their disease conditions ($n = 44, 48.9\%$), forgot to take a drug, or were relieved before completion ($n = 18, 20\%$), and due to change of treatment ($n = 16, 17.8\%$). Major drug sources were pharmacies/drug stores with prescriptions ($n = 38, 42.2\%$) or without prescriptions ($n = 23, 25.6\%$), and families/friends ($n = 23, 25.6\%$). Out of unused medicines stored among households, a large number of drugs ($n = 25, 27.8\%$) were expired, and stored in a box ($n = 23, 25.6\%$) in which majority of unused drugs ($n = 56, 62.2\%$) were the tablets from (Table 2).

3.4. Types of unused medicines based on therapeutic categories

The present study found that antibiotics, analgesics, gastrointestinal tract (GIT) drugs, antihypertensive, and anti-diabetics were a class of unused drugs stored among households. Antibiotics ($n = 25, 27.8\%$) were the most, and anti-diabetics ($n = 5, 5.6\%$) were the least unused medicines stored among households (Fig. 3).

3.5. Factors associated with unused medication Storage practice

The multivariate logistic regression analysis evidenced that the presence of family members working in the health sector and the size of a family member were significantly associated with unused medication storage practice. The heads of the household who did not have a family member working in the health sector who did not store unused medications were 59.8% compared to those who had a family member working in the health sector (AOR: 0.402, 95% CI: 0.22,0.800). Moreover, households that possessed a family size greater than five members were 2.325 times more likely to store unused medication than a family size of fewer than three members (AOR: 2.325, 95% CI: 1.045,5.174)

Table 2 Characteristics of unused medicines in Households.

Items	Frequency(n = 90)	Percentage (%)
Reason for unused medicines storage		
Your conditions were improved	44	48.9
forgot them to take or relieved before completion	18	20
The change in treatment	16	17.8
Others	12	13.3
Source of unused medicines		
Pharmacy/drug store with prescriptions	38	42.2
Family/friend	23	25.6
Pharmacy/drug store without prescriptions	23	25.6
Others	6	6.6
Status of unused medicine		
Not expired	32	35.6
Expired	25	27.8
Not known	33	36.6
Storage place of unused medicines		
Shelf	22	24.4
cupboard	16	17.8
Box	23	25.6
Cabinet	19	21.1
Others	10	11.1
Dosage form		
Tablet	56	62.2
Injectable	6	6.6
Capsule	15	16.6
Others	13	14.4

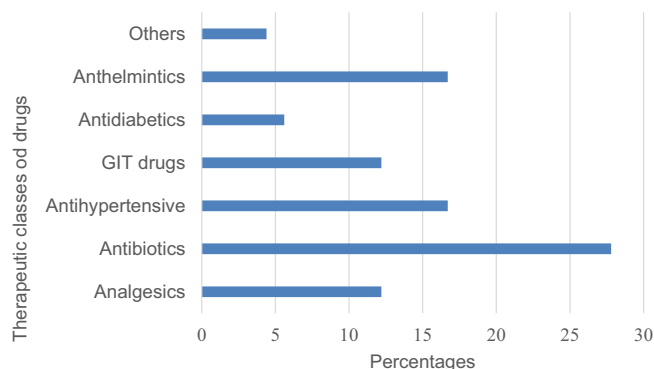


Fig. 3. Therapeutic categories of unused medicines in households.

(Table 3).

4. Discussion

Medicine is a key element in all healthcare delivery systems and a major contributor to many household costs. Following increased drug access, the bulk of medicines became unused and stored at home.¹⁸ Accordingly, the current study revealed that about 23% of households were found to store unused medicine at home. This finding is three to four times lower than the study conducted in Nigeria,¹⁹ and Saudi Arabia,²² which reported 65.9% and 89.3% unused medicine storage at home respectively. This difference in magnitude could be the difference in self-medication practice among households in Nigeria, 91.2%,²¹ Saudi Arabia, up to 81.4%,²² and Ethiopia 35.9%,²³ to 72.2%.²⁴ Contrarily, the magnitude of unused medicine storage at home in our study is higher than the study carried out in North-western Ethiopia, in which 13.8% of households stored drugs at home.¹⁰ This discrepancy may be due to variations in the residency place of respondents as in our study, the respondents are only from town while the comparator was from both rural and urban, in which the majority of them were from rural. Thus, the lower prevalence of unused drug storage from the comparator study can be attributed to the fact that a large number of

Table 3
Factors Associated with Unused Medication Storage Practice.

Study variables	Unused medication storage (%)		COR (95% CI)	AOR (95% CI)
	Yes	No		
The highest educational level in the household				
Can write and read	22 (24.4%)	77 (25.1%)	I	I
Primary school	29 (32.2%)	85 (27.7%)	0.837 (0.444,1.579)	0.921 (0.467,1.814)
Secondary school	27 (30.0%)	60 (19.5%)	0.635 (0.329,1.224)	0.648 (0.322,1.304)
College	7 (7.8%)	62 (20.2%)	2.531 (1.015,6.312)*	2.447 (0.936,6.400)
Degree and above	5 (5.6%)	23 (7.5%)	1.314 (0.448,3.858)	1.372 (0.440,4.280)
Occupational status of household head				
Government Employee	10 (11.1%)	58 (18.9%)	I	I
Farmer	38 (42.2%)	121 (39.4%)	0.549 (0.256,1.178)	0.655 (0.288,1.489)
Private Employee	31 (34.4%)	73 (23.8%)	0.406 (0.184,0.896)*	0.520 (0.225,1.205)
Labourer	3 (3.3%)	35 (11.4%)	2.011 (0.518,7.811)	2.427 (0.598,9.852)
Other	8 (8.9%)	20 (6.5%)	0.431 (0.149,1.244)	0.561 (0.179,1.757)
Number of family members				
<3	37 (41.1%)	103 (33.6%)	I	I
3-5	43 (47.8%)	133 (43.3%)	1.111 (0.668,1.849)	1.048 (0.609,1.803)
>5	10 (11.1%)	71 (23.1%)	2.550 (1.191,5.460)*	2.325 (1.045,5.174)*
The family member in your family working in the health sector				
Yes	14 (15.6%)	86 (28.0%)	I	I
No	76 (84.4%)	221 (72.0%)	0.383 (0.199,0.738)*	0.402 (0.202,0.800)*
Insurance coverage				
Yes	31 (34.4%)	144 (46.9%)	I	I
No	59 (65.6%)	163 (53.1%)	0.595 (0.365,0.970)*	0.663 (0.409,1.173)

Abbreviations: COR crude odds ratio, AOR adjusted odds ratio, 95% CI 95% confidence interval; *statistically significant at 95% CI.

Ethiopians are dependent on traditional medicine,¹² especially in rural areas. On the other hand, the disposal of unused or expired pharmaceuticals has gained a particular interest in the world.²⁵ To this point, our study found that most of the households disposed of unused drugs by burning, and bury in the ground with a lack of shreds of evidence showing that was the right way of disposing of the drug. Our finding is similar to the previous studies conducted in Serbia,²⁶ the United States⁷, and Kabul,²⁷ where the most frequently used method of disposing of unused drugs was throwing them into household trash, though there were some experiences of returning unused drugs to the pharmacy.²⁸ In any way that the drug management program is efficient in disposing of unused drugs, the storage of unused drugs is likely happening anywhere among households.^{6,10} Thus, the best way to prevent such an undesirable event is to educate the public and encourage health professionals to understand their contribution to problems and solutions, as well as develop a standard protocol for the handling of unused drugs among patients.²⁹ Our study also evidenced that the main reasons for unused medicine storage were a relief of disease conditions, forgetting to take

drugs or relief before completion, and a change of treatment, and similar reasons were reported elsewhere.^{30,31} Previous studies found that the class of medicines most often stored unused were antibiotics,^{7,20,32} similar to the therapeutic class found in our study. This might be due to the high rates of antibiotic self-medication practice in developing countries, which is often related to inappropriate drug use.³³ It could show that there is an increasing potential for antibiotic resistance; therefore, robust, safe, and cost-effective unused drug management is indispensable.²⁷ Contrary to a previous finding, the current study indicated that households with a family member working in the health sector had a lower possibility of storing unused medicine at home than households without a family member working in the health sector, which can reduce the self-medication practice of households.²¹ This could be explained by the fact that households with members of the healthcare profession are more likely to raise awareness about the home storage of unused drugs. In addition, our study showed that households with a family size greater than five members were 2.325 times more likely to store unused medication than households with a family size of fewer than three members. This could be discussed as the possibility of having more medicine among a large number of households, particularly when there is a risk of communicable infection at home. Therefore, there may be an opportunity to store unused medications for reasons such as relief of disease conditions, forgetfulness, and treatment changes that were revealed in the current study.

4.1. Limitations of the study

As this study employed a cross-sectional design, it may be difficult to observe the temporal link between variables, and unlike a longitudinal design, it could not provide much more substantial evidence of causality, and the reliability of the questionnaire was not tested in detail.

5. Conclusion

The magnitude and improper disposal of unused medicines storage among households were significant in the study area. Thus, the best way to prevent such an undesirable event is to educate the public and encourage health professionals to understand their contribution to problems and solutions as well developing a standard protocol for the handling of unused drugs among patients is all-encompassing.

Authors' contributions

All authors made a significant contribution to the work reported including reviewing and editing the manuscript. G.H. and A.B. conceived of the presented idea and developed the theory, performed formal analysis, validated the outputs, and wrote the original draft. A.M. and J.S. took part in designing the concept, verified the analytical method, found resources, supervised the project, and coordinated responsibility for the research activities.

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Ethical approval and consent to participate

For this study, the ethical principles set out in Helsinki's declarations were followed. Jimma University Institutional Review Board approved the study (Reference, IoH/SoP/21/2013(2021)). Written consent was obtained from the participants before conducting this study. Participant information obtained is kept confidential. The withdrawal right of study participants from the involvement of the study at any time was assured.

CRediT authorship contribution statement

Andualem Mitiku: Resources, Data curation, Conceptualization. **Azmeraw Bekele:** Writing – review & editing, Writing – original draft, Validation, Supervision, Software, Methodology, Formal analysis, Conceptualization. **Jafer Siraj:** Writing – review & editing, Software, Investigation. **Gemmechu Hasen:** Writing – review & editing, Visualization, Validation, Supervision, Software, Methodology, Formal analysis, Conceptualization.

Declaration of competing interest

All the authors declare that they have no established conflicting financial interests or personal relationships that may have influenced the research presented in this paper.

Data availability

Documents supporting this study are available upon request from the corresponding author.

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