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RESEARCH ARTICLE

# Assessment of medicines and potential pharmaceutical wastes management among households in Lamongan, Indonesia

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## Abstract

**Background:** Storing medicines at home has been linked with irrational use, misuse, and pharmaceutical waste leading to an increased burden on the health system. **Objective:** This study examined the practice of storing and handling medicines at home, calculated the potential economic loss of pharmaceutical wastes, and measured the knowledge, attitude and practice (KAP) of household medicine management. **Method:** A cross-sectional household survey using a pre-validated ReDiUM (Return and Disposal of Unused Medications) questionnaire was conducted in Lamongan, Indonesia. A convenience sampling of 100 families was done and the findings were subsequently analysed. **Results:** A low portion of families (37%) obtained medicines from authorised pharmacies. The majority (68%) mentioned that housewives managed the medicines at home. More than half (57%) stated that they still keep the leftover medicines and only one-third of the respondents (37%) stored them in the medicine basket. As a result, potential economic loss was estimated at around \$2 per family. The Spearman rank correlation coefficient test showed a strong positive association between knowledge and attitude ( $p < 0.05$ ) **Conclusion:** Management of medicines at home has been an underrated topic within contemporary pharmacy research despite its potential threat to community health.

## Introduction

Handling, storage and disposal of household medicine is a public health problem worldwide. Poor management of household medicines has contributed to inappropriate drug use and non-adherence (Hussain *et al.*, 2019). It is common for consumers to store their medicines at home. For instance, 29-44% of Ethiopians stored medicines at home (Wondimu *et al.*, 2015; Teni *et al.*, 2017). The percentage seems higher in middle to high-income countries such as Iran, Greece, the USA, and Indonesia, in which 82-100% of the households store medicine (Teni *et al.*, 2017; Prasmawari, 2021).

The presence of medicines at home may lead to the use and disposal of waste. Consumers need to understand how to take their medicines properly, preventing them from unsafe practices and lack of compliance. In addition, proper handling, storage and safe disposal of medicines are also critical since it is associated with less pharmaceutical waste

and reduced pharmaceutical residues in the environment (Gupta *et al.*, 2019).

Several campaigns and initiatives have been launched to reduce the number of unused and wasted pharmaceuticals. For instance, in New Zealand and Canada, consumers were encouraged to follow protocols for safe disposal practices. Countries with limited resources such as Afghanistan even allocated one per cent of the cost of medicines for pharmaceutical waste management practices. Indonesia introduced a program for returning unwanted and unused medicines to pharmacies in 2019 (Barnett-Iltzhaki *et al.*, 2016; BPOM RI, 2019). However, little is known about the sustainability of this program to date.

Despite the initiatives to manage household pharmaceutical waste, no study has so far been conducted to examine the practice of handling, storage, and the economic loss of pharmaceutical wastes at the household level in Indonesia. Therefore, this study aimed to investigate

these practices and to also calculate the cost of leftover medicines.

## Methods

### Study design

This study is a descriptive cross-sectional study (Masturoh & Anggita, 2018). Data were collected using a pre-validated ReDiUM (Return and Disposal of Unused Medications) questionnaire in tandem with direct observations and interviews in Lamongan, a highly populated district in East Java Indonesia. The study was conducted from April to May 2022. Respondents were recruited using convenience sampling with a minimum sample size of 100 families.

The questionnaire has the knowledge, attitude and practice of managing expired and unused medicines in the family. In addition, types, amounts, storage and handling practices, and the cost of leftover medicines were also investigated. Two researchers visited the respondents' houses to observe the practice and calculate the economic loss of these medicines. Data were subsequently analysed using descriptive statistics and a correlation analysis test was used to measure KAP variables. The cost was measured using the maximum retail price applicable at the time of observation.

## Results

A total of 100 respondents participated in this study. The characteristics of respondents are shown in Table I. Most respondents mentioned housewives as the members of the family who are responsible for the management of medicines at home (68%). In terms of education, the majority of respondents only completed secondary level of education (81%).

**Table I: Characteristics of respondents (N=100)**

Characteristics	N (%)
<b>Gender</b>	
Female	83 (83%)
Male	17 (17%)
<b>Education</b>	
Didn't graduate from school	1 (1%)
Elementary school	8 (8%)
Junior high school	17 (17%)
Senior high school	55 (55%)
Tertiary level/university	19 (19%)
<b>Status in Family</b>	
Father	8 (8%)
Mother	68 (68%)
Child	22 (22%)
Grandchild	2 (2%)

In total 695 medicines were identified. The majority are prescription medicines (57.0%) as shown in Table II. Only one-third of the respondents mentioned that they obtained these medicines from pharmacies (36.5%) reflecting a potentially greater concern of poor quality medicines obtained from non-legal sources.

**Table II: Characteristics of identified household medicines (N=695)**

Characteristics	N (%)
<b>Source of obtaining medicines</b>	
Nurse	159 (22.9%)
Physician	148 (21.3%)
Pharmacy	254 (36.5%)
Public health centre	39 (5.6%)
Hospital	17 (2.4%)
Shop/convenience store	62 (8.9%)
Others	16 (2.3%)
<b>Classification of medicine</b>	
OTC	224 (32.2%)
Prescription medicine	395 (57.0%)
Supplement	51 (7.3%)
Herbal medicine	19 (2.7%)
Cosmetics	1 (0.1%)
Not identified	4 (1%)
<b>Appropriateness of indication</b>	
Appropriate	641 (92.2%)
Not appropriate	18 (2.6%)
Not identified	36 (5.2%)
<b>Place to store the medicines</b>	
Cabinet	391 (56.3%)
Refrigerator	42 (6.0%)
Bag/wallet	4 (0.6%)
Medicine box/ medicine basket	258 (37.1%)
<b>Reasons to store medicines at home</b>	
Emergency use	8 (1.2%)
Anticipate future use	18 (2.6%)
Continued medication	577 (83.0%)
Etc	92 (13.2%)
<b>Potential economic loss of pharmaceutical waste</b>	<b>IDR 3,254,388.3</b>

Only a small portion of respondents stored medicines in special cabinets such as medicine boxes or medicine baskets (37.1%) despite most of these medicines were long-term prescription medicine and/or continuous-use medications (83.0%). The condition of medicines was relatively compromised with potentially degraded physical and chemical stability as shown in Figure 1.

This study estimated that the total potential economic loss due to unused and unwanted medicine is IDR 3,254,388.3 (USD 222) or on average USD 2 per person.

**KAP analysis**

The correlation between knowledge, attitude, and practice is shown in Table III. There was a strong correlation between the knowledge and attitude variables ( $p < 0.05$ ). However, overall there is no correlation between knowledge, attitude and practice.



**Figure 1: Drug storage condition**

**Table III: Correlation between knowledge, attitude and practice**

Variables		Knowledge	Attitudes	Practice
<b>Knowledge</b>	<i>r</i>	-	0.263	-0.047
	<i>p</i>		<b>0.008</b>	0.642
<b>Attitudes</b>	<i>r</i>	0.263	-	-0.047
	<i>p</i>	<b>0.008</b>		0.642
<b>Practice</b>	<i>r</i>	-0.047	0.082	-
	<i>p</i>	0.642	0.420	

**Discussion**

The increasing consumption of medicines over the years cannot be separated from the increase in the availability of health products and medicines for the treatment of most diseases and public health issues. In addition, the practice of self-medication has added to the number of medicines purchased by customers. This has created a challenge in how customers store their medicines in their homes. The fact that proper awareness of the rational handling, use and storage of

these medicines is inadequate, many developing countries have raised concerns about medication safety.

The findings in this study have confirmed that inappropriate practice of medicine management at home by the participating families has paved the way to a major void in the healthcare system due to potential medicine deterioration, unintentional medication use and risk of inappropriate use hence the emergence of patient safety issues. Potential economic loss is also possible given the large number of medicines stored.

Literacy about the management of pharmaceutical waste is critical as it may build awareness about the concern of the waste to the community and environmental health. Whilst this study did not investigate the awareness of the respondent, the educational level can be a predictor of the knowledge of waste management. The fact that housewives are influential enough to manage the medicines at home might present different outcomes in households. This has been associated with the capacity of the individual, including the knowledge and awareness, to create and reinforce “culture” i.e. proper practice.

The findings of this study are different from formerly published articles since a great proportion of medicines stored at home were prescription medicines yet they were obtained from non-pharmacy sources (Arnold *et al.*, 2014; Barrenberg & Garbe 2015; Rogowska *et al.*, 2019). This is important to note since community pharmacy was not the top preference of the respondents to obtain medicine. Therefore, scrutiny of the availability of pharmacies is perhaps required. Poor access to quality pharmaceuticals may lead to unsafe pharmaceutical practices with a lack of pharmacy stores has been connected to this issue.

Improper storage of medicines does not only affect the quality of medicines, but it also may compromise the safety of others due to irresponsible use of medicines. Several health risks from improper medication storage may arise, such as reduced efficacy which leads to failure to meet the target of the therapy and increased toxicity due to degraded stability.

The economic burden was calculated at USD 2 per household. This number is significant to the portion of Indonesian monthly earnings at the amount of USD 192 in 2022 (CEIC, 2022). This means almost 1% of the earnings was wasted due to improper medicine management at home. This finding sheds light on the unhealthy and improvident habits of spending money on healthcare. Given the income per capita of Indonesia, it is essential to effectively allocate spending for better care.

This study highlighted that proper handling, storage and disposal of pharmaceutical waste has been a concern within community health. The insignificant correlation between KAP confirmed the disparities between knowledge and practice. Many factors can be the cause including the various sociodemographic factors to KAP. Specific to this matter, the findings of this study cannot be neglected from the fact that most of the respondents had a background of secondary level education implying a modest level of education and literacy.

Overall, this study found that the potential risk of improper handling and storage of household medicine is prevalent. Improving literacy and awareness can be instrumental to address this challenge.

## Conclusion

Mothers at home were the responsible persons for managing medicines in the household. A small portion of medicines were obtained from pharmacies with few respondents properly storing these medicines. The potential economic loss on average was estimated at USD 2 per person. There is a significant correlation between knowledge and attitudes ( $p < 0.05$ ) in the management of medicines at home.

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