

IDENTIFICATION OF PUBLIC MEDICINE STORAGE PROFILE IN THE COMMUNITY PHARMACY: A SYSTEMATIC REVIEW

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ABSTRACT

Background: Drug is the most common form of therapy and an integral part of almost all levels of care. The conditions and proper way of storing medicines at home are important aspects of safe and effective drug treatment. Information about the knowledge of patients with appropriate storage conditions, rational drug use, appropriate drug use and management of various drugs is essential in helping pharmacists identify which medicinal products and aspects of home storage require more attention when counseling patients. **Objective:** The aim of this systematic review is to identify and characterize the mode of storage associated with home-stored pharmaceuticals. **Methods:** This systematic review analyzes the storage methods for medicines to identify and characterize the storage methods associated with medicines stored at home. The limitation of publication used, namely English and Indonesian in the last 10 years, and obtained through literature that can be considered relevant. **Result:** This systematic review was conducted in the period July, August, September 2020 - February 2021. As many as 20 journals were obtained. Those who met the inclusion criteria were 10 journals. Of the 10 journals that had met the inclusion criteria, 3 journals were excluded so that only 7 journals were used in literature review / systematic review. Storage of medicines in the household is based on the presence of family members who have certain diseases so that they have to consume drugs in the long term, the presence of health workers, and the education level of family members. Problems that can arise with drug storage conditions are impaired drug stability and can accelerate drug degradation prematurely. Storage of medicines in the medicine cabinet and out of reach of children is highly recommended. Placement of drugs in one place without being separated and a lack of awareness in administering specific markings can increase drug administration errors and lead to non-compliance with over-the-counter drug use. The application of drug management in the family can improve the quality of life and avoid the adverse effects of drug misuse. **Conclusion:** This study raises relation to medicines stored inside homes that warrant addressing that need pharmacists regarding public education in relation to drug therapy that goes beyond the dispensing process. Judging by the finding that pharmacists were not considered primary sources of drug-related information. The good practices should be encouraged through continued health education at health institutions and medicine retail outlets.

Keywords: Drugs, Storage, Household

INTRODUCTION

Medicines are the most common form of therapy in society and are an integral part of almost all levels of care^[10]. This contributes to ease of purchase, promotes self-medication, and a buildup of medicines in homes. Medicines stored at home ("home pharmacy") are often purchased over the counter, on the recommendation of a third party and without professional advice^[11]. The conditions and proper way of storing medicines at home are important aspects of safe and effective drug treatment. Drug storage and distribution are strictly regulated and closely monitored at every stage of the drug supply chain as specified in the guidelines for the Regulation of the Food and Drug Supervisory Agency (BPOM) Number 4 of 2018 concerning Supervision of Drug Management, Medicinal, Narcotics, Psychotropic Substances, and Pharmacy Precursors in Pharmaceutical Service Facilities^[1]. However, information about the knowledge of patients with appropriate storage conditions, rational drug use, the dangers associated with inappropriate drug use, and the management of various drugs is lacking^[12]. In addition, there has been a steady increase in the consumption of over-the-counter and prescription drugs. Medicines are purchased with and without a prescription and stored in various places in the home. Some places in the house are not suitable for storing medicine. For example, storing medicine in the bathroom is a common practice. This exposes the drug to humidity and high temperatures which can accelerate its degradation and shelf life. Even more, exposure to certain drugs to light can lead to photodecomposition and, consequently, loss of potency and efficacy^[12]. Indiscriminate purchase of medicines, unsuitable storage conditions, exchange of medicines with family members and friends, and irrational use of drugs

without medical consultation can all lead to problem health^[6,16]. In general, improper drug storage contributes to health hazards^[17]. So that patients are expected to store their medicines at home according to the storage conditions stated in the Product Characteristics Summary, such as in the case of drugs requiring refrigeration or storage in the original (outer) packaging to protect from moisture or light, provided by the drug company in the insert packaging. and on drug packaging. In addition to adequate storage conditions, patients should use drugs before the expiration date and store medicines in undamaged primary packages to ensure drug quality. In addition, adequate storage practices also require that patients have access to drug information, by keeping identifiable drugs (eg for caregivers) and having a package insert available. Increased knowledge about home storage practices can help pharmacists identify which medicinal products and aspects of home storage require more attention when counseling patients. The objective of this Systematic review is to identify and characterize the storage method associated with home-stored pharmaceuticals (the "pharmacy community"). Increased knowledge about home storage practices can help pharmacists identify which medicinal products and aspects of home storage require more attention when counseling patients. The objective of this Systematic review is to identify and characterize the storage method associated with home-stored pharmaceuticals (the "pharmacy community"). Increased knowledge about home storage practices can help pharmacists identify which medicinal products and aspects of home storage require more attention when counseling patients. The objective of this Systematic review is to identify and characterize the storage method

associated with home-stored pharmaceuticals (the "pharmacy community").

MATERIAL AND METHODS

This systematic review analyzes the storage methods for drugs to identify and characterize the storage methods associated with medicines stored at home (the "pharmacy community").

Study identification

Writing a systematic review uses a literature study. The literature review procedure used is by searching using online searches through the Google Scholar, WHO, PubMed, and PubMed Central instruments, Science Direct and several other guidelines. The keywords used are public drug storage, community pharmacy, public medicine storage profile, household drug storage, drug storage in the community

Eligibility Criteria

Publication restrictions used, namely English and Indonesian in the last 10 years, and obtained through literatures that can be considered relevant and reliable include quasy experiments, descriptive cross-sectional designs, and randomized control trials (RCTs). The level of evidence is determined based on the classification issued by the Oxford Center for Evidence-based Medicine Level of Evidence.

All cross-sectional articles, RCTs, experiments that provide study studies on how to store medicines at home (pharmacy community) are downloaded first. The article must contain the storage area for the drug, the type of drug preparation material, the type of medicine being stored, the problems encountered during the storage of the drug, and the purpose for using the drug (for the term or short term according to the disease).

Exclusion criteria are articles that discuss only one type of storage area.

Data Extraction and synthesis

Data ecstasy was performed by one reviewer using Microsoft Excel and Microsoft Word software. First, data extraction is carried out by looking for the characteristics of each article, namely author, country, study design, stored medication, history of chronic diseases, medicine storage, drug storage problems.

The second extraction is done by looking for statistics from the type of stored medication, history of chronic diseases, medicine storage, drug storage problems and analyzing the influencing factors.

RESULTS

Search Result

This systematic review was conducted in the period February - Mei 2021. The type of study used was a cross-sectional study. Journals used from Google Scholar, WHO, PubMed, and PubMed Central, Science Direct and several other guidelines. Obtained as many as 20 journals. Those who met the inclusion criteria were 10 journals. Of the 10 journals that had met the inclusion criteria, 3 journals were excluded so that only 7 journals were used in literature review / systematic review.

Studies Characteristics

All articles analyzed were cross-sectional studies from 2011 to 2020. The articles included in the study came from several countries such as Gondar Town in northwestern Ethiopia^[13], Qatar^[5], Dutch^[14], Tigray Region Northern Ethiopia^[15], Rowan Camden University New Jersey Pediatric ED of a tertiary referral university hospital ED^[8], Northern United Arab Emirates^[12], and Primary Care Unit city of Divinópolis^[3].

DISCUSSION

The storage of medicines in the household is based on several factors, namely the presence of family members who have certain diseases so that they must take drugs in the long term, the presence of health workers, and the education level of family members^[13].

When storing drugs, it is necessary to examine the location of the expiration date, listen carefully when pharmacists explain drug information, and be active in finding out about drug expiration information. Problems that can arise with drug storage conditions are impaired drug stability and can accelerate drug degradation prematurely^[4]. Disorganized storage of medicines in various places in the household can lead to unintentional non-compliance such as use of drugs without a doctor's prescription, use of antibiotics and drugs together in the family, danger to children's health, rapid degradation. So the storage of medicines in the medicine cabinet and out of reach of children is highly recommended^[12].

Regarding drug administration, the majority of people in the United Arab Emirates store medicines without being separated and only placed in drawers. Placement of drugs in one place without being separated between those used and for supplies can allow errors in drug use, and lead to non-compliance in the form of joint drug use without a prescription^[12]. Low public awareness about giving special labels causes errors in using drugs so that labeling can make it easier for people to use drugs according to the complaints they face, and labels can minimize the risk of misuse of drugs because the function of drugs is clearly stated on the label^[9].

The application of drug management in the family which includes family roles, responsibilities and expectations, living arrangements, interpersonal relationships, social norms and the presence of financial

and health-related resources (eg employment status, availability of health insurance). The role of the family and the combination of tasks, equipment and technology can improve the quality of life and avoid the detrimental effects of drug mismanagement and increase safety assurance of drug use^[2].

CONCLUSION

This study raises relation to medicines stored inside homes that warrant addressing that need pharmacists regarding public education in relation to drug therapy that goes beyond the dispensing process. Judging by the finding that pharmacists were not considered primary sources of drug-related information. The good practices should be encouraged through continued health education at health institutions and medicine retail outlets.

REFERENCES

1. BPOM. 2018. *Regulation of the Indonesian Food and Drug Supervisory Agency (BPOM) Number 4 of 2018 concerning Supervision of the Management of Drugs, Drug Ingredients, Narcotics, Psychotropics, and Pharmacy Precursors in Pharmaceutical Service Facilities*. Jakarta: BPOM.
2. Doucette, WR, Vinel, S, Pennathur. 2017. Initial development of the Systems Approach to Home Medication Management (SAHMM) model. *Research in Social and Administrative Pharmacy*. 13 (1): 39–47.
3. Fernandes MR, Roberta C de F, Luanna GR da S, Rafaela SR, André OB 2020. *Storage and disposal of expired medicines in home pharmacies: emerging public health problems*. Universidade Federal de São João del-Rei, Divinópolis, MG, Brazil.
4. Huang, Y, Wang, L, Zhing, C, Huang, S. 2019. Factors influencing the attention to

- home storage of medicines in China. *BMC Public Health*. 19 (1): 1–10.
5. Kheir N, MS El Hajj, K Wilbur, RML Kaissi, A Yousif. 2011. An exploratory study on medications in Qatar homes. *Drug, Healthcare and Patient Safety*. 99–106.
 6. Kiyingi KS, Lauwo JAK. 1993. Drugs in the home: danger and waste. *World Health Forum*. 14: 381–384.
 7. Pereira JR, Soares L, Hoepfner L, Kruger KE, Gutierrez ML, Tonini KC, *et al.* 2010. *Risks of self-medication: treating the problem with knowledge*. Santa Catarina: Joinville Region University.
 8. Salzman M, Lia C, Sandra N, Samuel B, Rupa K, Brigitte MB 2019. The Prevalence of Modifiable Parental Behaviors Associated with Inadvertent Pediatric Medication Ingestions. *Western Journal of Emergency Medicine*. 20 (2).
 9. Savira, M., FA Ramadhani, U. Nadhirah, SR Lailis, EG Ramadhan, K. Febriani, MY Patamani, DR Savitri, MR Awang, MW Hapsari, NN Rohmah, AS Ghifari, MDA Majid, FG Duka, G. Nugrahen. 2020. Drug Storage and Disposal Practices in the Family. *Community Pharmacy*. 7 (2): 38-47.
 10. Schenkel EP, Fernández LC, Mengue SS. 2005. *How Are Medicines Stored In Homes?* *Acta Farm Bonaer*. 24 (2): 266-70.
 11. Schwingel D, Souza J, Simonetti E, Rigo MP, Ely LS, Castro LC, *et al.* 2015. *Home pharmacy x Rational use of medicines*. *Rev Cad Pedagógico*. 12 (3): 117-30.
 12. Sharif SI, Abdueilmula RA, Hadeel A. B, Layal IH, Deema SK 2010. *Trends of Home Drug Storage and Use in Different Regions across the Northern United Arab Emirates*. Sharjah University: Department of Pharmacology, College of Pharmacy.
 13. Teni FS, Abdrrahman SS, Assefa B, Dawit W, Dessalegn AG, Zewdneh S, Befikadu L, Eshetie MB 2017. A household survey of medicine storage practices in Gondar town, northwestern Ethiopia. *BMC Public Health*. 17: 238.
 14. Vlieland ND, Bart JF van den Bemt, Charlotte LB, Marcel LB, Toine CGE, Helga G. 2018. Older Patients' Compliance with Drug Storage Recommendations. *Drugs Aging*. 35: 233–241.
 15. Wondimu A, Fantahun M, Birhanu D, Tadele E, Admassu A, Solomon A, Wondim M. 2015. *Household Storage of Medicines and Associated Factors in Tigray Region, Northern Ethiopia*. Mekelle University: Department of Pharmacy College of Health Sciences Ethiopia.
 16. Yayehyirad K. 1997. Self-care: a study of three communities in Ethiopia (special issue). *Ethiop J Health Dev*. 2: 9–75.
 17. Yousif MA. 2002. In-home drug storage and utilization habits: a Sudanese study. *East Mediterr Health J*. 8: 1–10.

No	Author	Country	Study Design	Stored Medication	History of Chronic diseases	Medicine Storage	Drug storage problems
1.	Teni <i>et al.</i> , 2017	Gondar Town in northwestern Ethiopia	Cross-sectional Study	Diclofenac (10.7)%, Paracetam (9.9)%, Amoxicillin (8.0)%, Hydrochlorothiazide (6.5)%, Enalapril (4.5)%, Metformin (4.2)%, Glibenclamide (4.0)%, Omeprazole (2.7)%, Insulin (2.4)%, Metronidazole (2.4)%, Nifedipine (2.4)%, Cotrimoxazole (2.2)%, Ciprofloxacin (1.8)%, Doxycycline (1.4)%, Tetracycline (1.4)%.	Yes: 30,5% No: 69,5%	Drawer (76.5)%, Refrigerator (5.2)%, Table (5.4)%, Bag/purse(4.0)%, Pockets on cloth (2.0)%, Others (6.9)%.	No drug storage problems. Drug storage conditions were good
2.	Kheir <i>et al.</i> ,2011	Qatar	Cross-sectional Study	Analgesics (21)%, Nonsteroidal anti-inflammatory agents (16)%, Allergy, cough, cold (14)%, Not specified/others (9)%, Anti-infectives (6)%, Vitamins, nutritional (5)%, Antihypertensives (5)%, Oral antidiabetics (4)%, Complementary alternative medicine (3)%, Antacids/prokinetics (3)%, Bronchodilators (3)%, Aspirin (2)%, Systemic steroids (2)%, Statins (2)%, Insulin antidiabetic agents (1)%, Antiepileptics (1)%.	Yes: 31% No: 69%	Kitchen (5.1)%, Fridge (24.9)%, Fridge and bedroom (1.2)%, Bedroom alone (50)%, Other (bathroom, living room other room) (19)%. Total= 253.	Storage of medicines in homes under damp and humid conditions, as well as exposure to light or high temperatures, can cause medicines to degrade more quickly than expected. Some medications were kept in the kitchen, and in around 25% of the cases in the fridge, where heat and humidity, respectively, could be problematic, especially for solid formulations, eg, tablets. In 19 cases, medications were stored in the living room or in the bathroom. Lack of a single storage place for

				Inhaled steroids (1%), Hormonal (1%), Endocrine, thyroxine (1%), Immunosuppressants (1%), Neurological (1%) Other, medicines for other cardiovascular diseases (1%), Bone, joint (0)%.			regular medications leads to a greater chance of missed doses, except if the medications are stored in different locations because of time of administration (eg, morning medications on the kitchen table and bedtime medications at the bedside).
3.	Vlieland <i>et al.</i> , 2018	Dutch	Cross-sectional Study	C09 agents acting on the renin-angiotensin system (55.0%), A02 drugs for acid-related disorders (48.5%), C10 lipid-modifying agent (47.9%), B01 Antithrombotic agents (47.9%), C03 Diuretics (43.2%), C07 Beta-blocking agents (40.2%), C08 Calcium channel blockers (24.9%), R03 drugs for obstructive airway diseases (20.7%), C01 cardiac therapy (16.0%), A10 drugs used in diabetes (15.3)%.	Yes: 99% No: 1%	Kitchen (excluding the refrigerator) (56.2%), Refrigerator (13.0%), Bedroom (37.3%), Living room (33.1%), Bathroom (19.5%), Other (e.g. hallway, basement) (22.5)%.	53.2% of drugs requiring refrigeration were not stored according to the recommended storage conditions. Patients with at least five prescription drugs or having at least one drug that requires refrigeration often do not comply with storage recommendations.
4.	Wondimu <i>et al.</i> , 2015	Tigray Region, Northern Ethiopia	Cross-sectional Study	Analgesics (12%), Antibiotics (14%), Antihypertensive drugs (10%), ART (8%), Antacids (4%), Antiasthmatics (2%), Minerals & vitamins (2)%.	Unclear	Drawer 36%, Cupboard 35%, Table/Shelf 20%, Bag 6%, Refrigerator 4%.	Condition of storage of drugs were not appropriate and in fact the storage places were accessible to children which can lead to accidental ingestion of oral drugs by children. Around 5% of the

				Antidiabetics (2)%, Hormonal drugs/ contraceptives (2)%, Anthelmentics (2)%, Antiepileptics (1)%, Others (5)%. Total (62)%.			drugs were expired in this study.
5.	Salzman <i>et al.</i> , 2019	Universitas Rowan, Camden, New Jersey. Pediatric ED of a tertiary referral, university hospital ED	Cross-sectional Study	Acetaminophen (4.0)%, NSAIDs (4.4)%, Opiate analgesics (2.1)%, Aspirin (1.4)%, Tramadol (1.0)%.	Unclear	Kitchen cabinet above counter (23.6)%, Medicine cabinet in bathroom (23.2)%, Pocketbook (21.0)%, On nightstand or dresser in bedroom (11.9)%, In bedroom in a drawer (10.0)%, In a closet (4.8)%, Locked drawer or safe (2.9)%, Kitchen cabinet below counter (1.7)%, Top of refrigerator (1.0)%, On countertop (1.4)%, In the refrigerator (1.0)%, In the car (0.7)%, Windowsill (0.2)%.	75,2% caregivers reported storing their prescription medications in a secure place.
6.	Sharif <i>et al.</i> , 2010	Northern United Arab Emirates	Cross-sectional Study	NSAIDs (74%) Antidiabetics (14%) Antihistaminics (44%) Antihypertensives (26%) Antidiarrhoeals (20%) Anticholesterols (14%) Laxatives (24%)	Unclear	Location of home pharmacy: Kitchen (42%), Bedroom (39%), Sitting room (16%), Bathroom (3%). Checking home	3% the bathroom is certainly not an advisable site for keeping medications as they are at risk of exposure to high humidity and temperatures that accelerate their instability.

				<p>Antiasthmatics (6%) Eye drops (60%) Antidepressants (14%) Nasal decongestants (50%) Oral contraceptives (14%)</p>		<p>pharmacy for: General condition (29%), New additions/ Replacement (16%), Expired medicines (55%).</p>	<p>42% the high temperature in the kitchen during cooking, a daily activity, may also have the same effect as the high humidity and temperatures in the bathroom. And the habit of keeping but not using expired medicine, as followed by 22 participants (13%), is certainly not advisable as it could increase the likelihood of misunderstanding and the risk of health hazards because of ineffectiveness or possibly toxic degradation products</p>
7.	Fernandes <i>et al.</i> , 2020	Primary Care Units, city of Divinópolis	Cross-sectional Study	Data NA	Unclear	<p>Kitchen (58.6%), Bedroom (57.2%), Living/pantry room (14.4%), Bathroom (2.1%), Others (1.4%). Total= 566%</p>	<p>Approximately 8% (n=32) of interviewees reported inappropriate storage of thermolabile products and 17% reported exposure to sunlight and humidity. Storage within reach of children was often reported (66%).</p>