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In-Home Storage and Disposal of Drugs in Libya

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ABSTRACT

Background: *In-home storage and disposal of drugs is an overlooked health issue that may lead, if in appropriately practiced, to serious health hazards.*

Objectives: *This study was undertaken to assess the methods of storage of medicines at home, and disposal of unused and expired drugs.*

Methods: *We used a prepiloted questionnaire posted on the net. The questionnaire includes questions on demographics of participants, whether they have a home pharmacy or cabinet, when and what they check their home pharmacy for, and the methods employed to dispose of expired drugs. Collected data were encoded and analyzed using Statistical Package for the Social Sciences (SPSS, version 20, Chicago, IL, USA). Descriptive statistics was used to describe the study variables using frequencies and percentages.*

Results: *A total of 350 completely filled questionnaires were received back. Age of the majority (305, 87.7%) of the participants ranged between 18-44 years, and most (87.1%) of them were females, and have high school education (81.1%), and have home pharmacy, kept in the kitchen (49.4%) or bedroom (30.3%). About 60% of the participants assigned organization of the home pharmacy to son/ daughter. The average number of drugs stored at home is 14.3. About 50% they check the home pharmacy monthly (319, 91.1%) for expired medicines, and disposed of expired medicines by throwing in domestic waste.*

Conclusion: *It is necessary to increase public's awareness of proper methods of storage of drugs at home, and also the appropriate methods of disposal of expired drugs. Health authorities and pharmacists should collaborate to produce guides and a system of return-back leftover, unused, and also municipalities in every city can arrange for appropriate gross disposal of such drugs under the supervision of health authorities.*

Keywords

Home pharmacy, Use, Storage, Medicines, Disposal.

Introduction

The purpose of this study is to determine how medicines are stored and used, and how expired ones are disposed at home. Instructing patients on how to use and store prescribed medicines is the responsibility of the pharmacist. There is a lack of information on the use and storage of both over-the-counter (OTC), and prescription drugs [1]. Medications are stored in various forms and locations in practically every home. These consist of unused, leftover, and expired drugs. Some sites at homes are not suitable for storing medicines since exposure to extreme temperatures and humidity, may hasten their expiry and deterioration, and exposure of certain medicines to light may result in photodecomposition and ensuing loss of potency and efficiency [2].

As the tendency of self-medication practices increases, there is a rising number of such hoarded drugs. Irrational use, indiscriminate drug purchases, improper storage conditions, and medicine

exchanges with friends and family members have all been suggested as major health issues [3]. Furthermore, it has been emphasized that the practice of storing leftover prescription drugs may be utilized to gauge patient non-adherence [4]. Flushing in the toilet, throwing in domestic waste, burying in the backyard or returning expired medicines to the drugstore are common methods of disposal practiced by the public [3]. The improper disposal of unwanted and expired drugs poses a threat to the environment by polluting drinking and surface water, raising the possibility of the creation of resistant infections, and eventually harming both people, and marine life [5-7].

Throwing expired and unused medicines in domestic waste puts garbage collectors, children, and pets' health at risk. The disposal of sharps like lancets, insulin pens, and syringes used by diabetics may potentially make the issue even worse [8]. Despite its significance, the problem of unused and expired pharmaceuticals in Libyan families has not received much attention. Thus, the goal of the current study is to evaluate the public's understanding, attitude, and behavior regarding storage and the proper disposal of unwanted pharmaceuticals at home in Libya.

Methods

Sampling

Using Rao soft sample size calculator a total of 350 household units were targeted in Benghazi, the second largest city in Libya.

Inclusion and Exclusion Criteria

Only adults who are responsible as household chair, or an adult assigned by his/her parents to take care of medicines at home were included. Younger age groups were excluded.

Questionnaire Design

The household unit is defined as a place of residence for household chairs and their children. A self-administered pre-validated questionnaire was developed to contain 20 items with close-ended questions. The questionnaire was written in Arabic and English languages. The study was conducted among 350 household units. The first part of the questionnaire covered the demographic characteristics of participants including age, gender, level of education, and number of children. The second part covered questions inquiring on "whether a home pharmacy is available or not", its location, its environment conditions, and accessibility of children to the home pharmacy. Questions in this part also covered general aspects including, "reasons for checking the home pharmacy", "method of disposal of expired drugs", "access of children to the drugs in the home pharmacy", "number of medications available at home". The last part of the survey questioned participants on both prescription and OTC drugs available at home, and if whether nasal, eye, or ear drops are used after more than a week of thir first time use. The questionnaire was distributed by hand, and was also posted on the net: https://docs.google.com/forms/d/e/1FAIpQLScsQ9N3rQzOpNrOjH6-E2paoGyGN0tqeQK4Sy-YtKKPjkFLDQ/viewform).

A consent was provided with the questionnaire explaining the nature and purpose of the study, and informing the participants that filling out the survey will be considered as voluntary approval to participate in the study. The participants were also informed that their identities will be kept confidential, and that they could withdraw at any stage without any consequences. It was also requested that the survey be filled out by the chair of the household unit or the adult assigned to that duty. The average time to fill out the questionnaire was 10-15 minutes.

Ethical Approval

Ethical approval was obtained from the Research Ethics Committee of the Libyan International University (Certificate Reference N0: PHR-2023-00143).

Statistical Analysis

The data was encoded and analyzed using Statistical Package for the Social Sciences (SPSS, version 20, Chicago, IL, USA). Descriptive statistics was used to describe the study variables using frequencies and percentages. Chi-square test was used to identify any significant difference among the participant's responses regarding certain statements in the questionnaire with a significant level of $p < 0.05$.

Results

Demographic Characteristics of the Participants

We received 350 completed questionnaires. Table 1 shows the demographic characteristics of the participants. The majority (305, 87.1%) of the participants were females, of age within the range of 21-30 years, and with no children (163, 46.6%). The education level of most (284, 81.1%) of the participants was university level, and about two thirds (213, 60.9%) of the participants stated that the family member in charge of the home pharmacy was the son or daughter.

Most (305, 87.1%) of the participants have a home pharmacy. About half (173, 49.4%) of participants kept the home pharmacy in the kitchen, and the about one third (106, 30.3%) kept medicines in the bedroom (Table 2). About two-thirds (223, 63.7%) of the participants selected a cold-dry environment for their home pharmacies. Table 2 also shows that only 9 (2.6%) of the participants allow their children to have access to the home pharmacy, while the rest (341, 97.4%) of participants do not allow that. More than half (206, 58.9%) of the respondents assign their son or daughter to act as chairs of household unit in charge of the home pharmacy while with almost 117 (33.4%), the mother was in charge of the home pharmacy.

Table 3 shows that participants check the home pharmacy for expired drugs (182, 50.2%), general condition (120, 34.3%), or to get red of expired drugs (136,38.9%). The majority (319, 91.1%) of the participants throw expired medicine in domestic waste.

Expired drugs are disposed off mainly (319, 91.1%) by throwing in the domestic waste, and the time most participant (265, 75.7%) dispose off of expired drugs is at their expiry date. Table 4 shows that most (281, 80.3%) of the participants kept over-the-counter

(OTC) drugs at home. With 96 (27.4%) of the participants having 10 drugs. However, about quarter (82, 23.4%) of the participants keeps more than 20 drugs at home (Table 4). The average number of drugs kept at home is 14.3.

Table 1: Demographic characteristics of the participants.

Question/statement	Frequency (%), n=350
Age (Years)	
18-20	90 (25.7%)
21-30	152 (43.4%)
31-44	65 (18.6%)
> 45	43 (12.3%)
Gender	
Male	45 (12.9%)
Female	305 (87.1)
Number of children in home	
None	163 (46.6%)
< 3	104 (29.7%)
> 3	83 (23.7%
Educational levels of household chair	
lliterate	5 (1.4%)
primary	5 (1.4%)
middle school	32 (9.1%)
High school	284 (81.1%)
University level	24 (6.9%)
Household chair	
Husband	35 (10.0%)
Wife	102 (29.1%)
Son/daughter	213 (60.9%)

Table 2: Availability and conditions of home pharmacy.

Question/statement	Frequency (%), n=350
Is there a pharmacy in the home?	
Yes	305 (87.1%)
No	45 (12.9%)
Where is the location of the pharmacy in the home?	
Kitchen	173 (49.4%)
Bathroom	27 (7.7%)
Bedroom	106 (30.3%)
Sitting Room	44 (12.6%)
Pharmacy environment	
temperature: hot	23 (6.6%)
cold -dry	223 (63.7%)
lightening: high -low	30 (8.6%)
air: open -closed	74 (21.1%)
Can your children have access to the home pharmacy?	
Yes	9 (2.6%)
No	341 (97.4%)
Who is responsible for the home pharmacy?	
Mother	117 (33.4%)
Father	27 (7.7%)
Son/Daughter	206 (58.9%)

Table 3: Reasons for checking the home pharmacy and methods of expired drug disposal.

Question / Statement	Frequency (%), n=350
Why you check the home pharmacy	
To add new medications	55 (15.7%)
To get rid off expired drugs	182 (52%)
To arrange medications according to user	39 (11.1%)
To check on general condition	120 (34.3%)
For replacement	7 (2.0%)
Expired drug are disposed of by	
Throwing in waste	319 (91.1%)
Flushing in toilet	12 (3.4%)
Returning to pharmacy	14 (4.0%)
Burying in backyard	5 (1.4%)

Table 4: Types of medicines and their numbers, and average number of drugs/home.

Question\Statement	Frequency (%), n= 350
Drug available at home	
OTC	**281 (80.3%)**
Prescription drugs	**69 (19.7%)**
How many drugs are kept at home?	
2	**22 (6.3%)**
5	**81 (23.1%)**
10	**(%27.4) 96**
15	**46 (13.1%)**
20	**23 (6.6%)**
More than 20	**82 (23.4%)**
Average number of drugs / home	**14.3**

When asked whether they used eye, nose or ear drops after more than a week when opened, nearly similar percentages answered yes (181,51.7%) and no (169, 48.3%).

Table 5 shows significant association between demographics of participants and different variables.

Table 5: Association between demographics and variables.

Demographic characteristic	Variable	Pearson Chi-Square, P<0.05
Age		
	Location of home pharmacy	**0.016**
	Why check home pharmacy	**< 0.001**
	Disposal of expired drugs	**0.028**
	Number of drugs at home	**0.011**
Gender	Disposal of expired drugs	**0.033**
Number of children at home	Disposal of expired drugs	**0.034**
Education level	Time of drug disposal	**0.012**
Household	Availability of home pharmacy	**0.002**
	Time of drug disposal	**0.01**
Household chair	Child use of home pharmacy	**0.002**
Household chair	Child use of home pharmacy	**0.002**

Discussion

This cross-sectional, questionnaire-based study was conducted among 350 participants in Libya. We investigated the public's knowledge about the in-home storage of medicines, and methods of disposal of unused and expired ones. Most of the respondents were females, with university degree, of age ranging from 21-30 years, and slightly less than half of them were without children.

The dynamic progress in pharmaceutical industry with the ongoing increase in drugs production and marketing is associated with increase in both prescription and over-the-counter medicines stored at home [9-11]. Keeping large amounts of drugs at home can be a source of hazards to families as it may lead to drug interaction, polypharmacy, poisoning, increased improper exchange of medications between family members and friends, irrational use of medications, waste of out of pocket money, and inappropriate storage and disposal of left over and expired drugs. Therefore, several studies have been undertaken across the globe to investigate the problems encountered with storage of drugs at home [3,12], and methods of disposal of unused and expired drugs. Investigations conducted earlier covered sources of pharmaceutical pollution, surveying over-the-counter and prescription medications purchasing, use, and disposal practices among university students [12-14].

In the present study, the average number of drugs stored at home was 14.3 which is comparable to that reported in Iraq [15], but higher than that (6 drugs) in UAE [3]. Such a wide difference may be due to the fact that in Libya patients can get free of charge prescription drugs at public polyclinics and hospitals, and also due to over prescribing by physicians, and dispensing of most drugs at community pharmacies without prescriptions. Among the other reasons, fear of patient of medications shortage, influence of advertisement, patient's insistence on the prescribing physician, polypharmacy, and patients visiting more than one physician were considered factors contributing to patients overstocking medications [16].

In most previous studies, one of the parents is the chair of the household [3]. However, in the current study, more than 50% of the parents assigned their son or daughter to take care of the home pharmacy. This is most likely because of the siblings mastering the English language besides their native Arabic, so they can read and interpret for their parents drug use instructions within the package inserts, help family members adhere to their medicines, and also because parents being elderly, or busy most of the time.

In the present study most (87.1%) of the participants had a home pharmacy cabinet, and about 50% of the participants keep their home pharmacy in the kitchen, 30% in the bedroom, while smaller proportion (7.7%) keep it in the bathroom. Keeping the home pharmacy in the kitchen or bathroom is not appropriate because of the high temperature and humidity that may accelerate the deterioration of the medicine [3,10,17]. According to the WHO guide on good storage practice, the appropriate storage condition for medicines is in a clean and dry place, maintained within acceptable temperature limits, and out of the reach of children [18]. About two thirds of the respondents stated that the environment of their home pharmacy location is cold-dry, such conditions do not apply to the kitchen, or the bathroom. In the latter sites, the fluctuating temperature and the high humidity may accelerate the degradation of the active constituents of the medications and hence their expiry date [3,19]. Surprisingly, 2.4% of participants admitted that their home pharmacy is accessible to their children. Such a trend should be discouraged as it subjects children to harm and severe health problems in case of ingestion of drugs in large amounts.

Slightly more than half the participants regularly check the home pharmacy for expired drugs, while smaller proportion of respondents check it for general conditions, replacement or additions of new drugs. Nearly one quarter of the respondents in the present study keeps more than 20 drugs at home. A majority (80%) of participants keeps over-the- counter drugs, while only 20% of participants keeps prescription drugs. It has been reported that the wastage of OTC medications is more than prescribed medications [20]. Self-medication is advisable for minor illnesses as it saves out of pocket money and time in addition to promoting ones self-care. On the other hand, stocking OTC drugs at home can lead to their abuse, and harmful interactions with prescription drugs. Slightly more than half the participants admitted using ear, nasal, and eye drops a week or more after being opened and used first time. Eye drops should not be used after a month of first use or if the solution became turbid or if its colour changed. For ear drops they can still be used up to four months except if there was clear change in the solution and the same applies for nasal drops. Among the reasons for a regular check of the home pharmacy is to dispose of expired drugs. In the present study, the majority of participants dispose of expired drugs by throwing it in domestic waste, while smaller proportions flush expired drug in toilet or sink, burry in backyard or return to pharmacy. Throwing expired drugs in domestic waste is not without hazards. It could be of harm to collectors of waste, children, pets, and the environment [3,21]. Medications packages with patient's information when thrown in waste can promote identity theft, and can also be a source of pharmaceutical drug diversion and counterfeiting [22].

Lack of knowledge about proper storage and disposal of medications, and the risks of unused or expired medicines are not restricted to the public as it has also been reported among health care professionals [20,23]. A study in Kabul demonstrated that more than 95% of the respondents surveyed had left-over medications at home and half of the interviewed population kept the unused medicines at home until expired [24].

In the present study 91.1% of the participants throw expired drugs in domestic waste. In many countries, the latter is the preferred way of disposal of both unused and expired medicines [3,19,25]. Only 3.4% of our participants flushed the expired medications down the toilet or sink. Such a practice is similar to that in UAE [8], but less than that reported for Kapul, and Kuwait [23,26].

It is worth noting that flushing expired medicines in the sink or toilet has been reported to be the best practice for liquid form medications [27]. Some of the respondents returned unused and expired pharmaceuticals to medical stores, which is similar to the practice in the USA through the Return Unused Medicines (RUM) system [28]. Such approaches towards safe disposal of leftover and expired pharmaceuticals significantly reduce the harm to the environment.

Limitations

The main limitation of this study is that in most cases the son/daughter were acting as household chairs taking care of the home pharmacy, therefore the responses were their own and not representative of others in the household units. Moreover, we did not attempt to study the types of drugs in relation to chronic diseases, if any, particularly in the light of the fact that in the country many prescription drugs can be purchased without a prescription.

Conclusions

Results of the present study indicated that despite having a home pharmacy, the majority of participants keeps it in the kitchen or bedroom. Keeping drugs in the kitchen with high temperature and humidity may accelerate their expiry and deterioration leading to health hazards. Also throwing expired drugs in the domestic waste may pose problems to the environment, waste collectors, and pets. Educational programs must be developed to increase public's awareness to appropriate storage of medicines at home, and the proper methods of disposal of leftover and expired medicines. A return back system is also advisable for the proper official disposal of unused and expired drugs under the supervision of health authorities. Pharmacist's contribution by educating patients is essential and beneficial in this respect.

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