

ORIGINAL ARTICLE

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Awareness of home drug storage and utilization habits: Saudi study**Marwa Ibrahim Koshok¹, Thuraiya khairillah Jan¹, Samia Mohammad AL-tawil¹, Ebtessam Abdulrhman Alghamdi¹,
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Abstract

The aim of the study was to investigate the awareness of residents in Saudi Arabia toward in-home drug storage and the using habits of their medications. This is a descriptive study that involved an electronic survey about drug storage and utilization habits. It was developed, pretested, and distributed via the social media among the population in Saudi-Arabia. About 1400 persons participated in this study. Around 84.4%, 96.6% and 58.3% of participants stored their insulin syringes, antibiotic or cough-syrup after opening in their refrigerator, respectively. Moreover, most of them avoided use or discard their products upon exposure to the sun or forgetting them in the car for the whole day. 87.5% disclosed that they usually check the expiration date on drug products before using and 49.7% added they always follow the instructions regarding duration-of-use compared with 45.85% who said sometimes they follow it. 99.7% of them reported that they avoid using products upon change in color or formulation. Finally, variable-correlation was found between the age distribution of participants and their responses. The results revealed that the participants exhibited promising awareness toward the in-home drug storage in Saudi Arabia

Keywords: Home drug, storage, awareness, antibiotic, insulin**Introduction**

Drug therapy represents the most common used modality of prevention and treatment of diseases[1]. The level of access to medications relies mainly on the most known classification of medication to either “prescribed” medications or “over the counter” medications. The safety, efficacy and abuse potential are the essential dependent factors of this classification. While drug-induced problems are considered the most crucial concerns to healthcare professionals, improper storage and disposal of medication can contribute to the share of this problem [1].

Pharmacists and other professionals most often counsel patients to proper use their medications including advice on the mode of administration, duration of therapy and conditions when they must refer to physicians while they are on medication. However, data on storage, disposal or decision of either continue on or dispose of shelf medication after a while left there are lacking [2,3]. Inappropriate storage and handling medications are prevalent in developing country and prescribed medications, especially antibiotics, are freely available without a prescription.

This is commonly seen in developed multiethnic countries where immigrants from developing countries tend to continue their inappropriate practice [4]. The inappropriate storage of medications eventually leads to losing their potency [5-7]. A good example of that is insulin when left at a high temperature in countries with hot climate. Mentioning that most manufacturers advise diabetic patients to store their insulin bottles in refrigerators at 2–8°C, but not frozen, with limiting usage or storage period to 1 month at room temperature (20–25°C), otherwise excursions of glucose level can dangerously ensue[5-7].

Several studies aimed to check the awareness of patients about home storage in developed country [3,8,9]. However, to our knowledge, little is known about how residents in Saudi Arabia store their in-home medications or how they possibly handle left over medications. Hence, the aim of this cross-sectional study was to evaluate the awareness of the population living in Saudi Arabia towards in-home drug storage.

Material and Methods**Questionnaire development**

A multiple-choice-questions survey has been created on Google Drive™ using an online survey creator option. The questions were initially developed in English then translated into Simplified Arabic language. After that, the questions were further reviewed by English and Arabic bilingual specialist to ensure consistency.

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The following step was the reviewal of survey's items by five academics, five administrators, and five students where they provided comments on its face validity and scope of items chosen to undergo evaluation. Their comments were considered for further development. The pre-final step included a pilot survey conducted on 15 participants of the target population to ensure validity.

The survey included a cover page that has a short introduction and a consent form so that we can analyze their data. The questions that were asked by the survey included storage area of insulin vials after opening, noticing medication expiry dates, disposal of insulin upon sun exposure, disposal of medication after color and formulation change, antibiotic storage place, antibiotic usage upon dissolution and forgotten for the whole day at room temperature, commitment to the duration of use, soluble dosage form storage area, continue using or disposal upon settlement of medication at the bottom of the bottle and continue using of cough medications for instance after leaving the bottle in the car for a while.

Participants and procedures

The target of the study was the Saudi population. The final survey form was distributed using different popular social media like Facebook, Twitter, Whatsapp, and Google Plus (ordered according to popularity).

Statistical analysis

Google Drive Data were exported directly to a Microsoft Excel file (Microsoft Corporation, Redmond, WA, USA). Descriptive statistics of the responses within the survey were compared amongst the three age groups (10-29 years, 30-49 years and 50-69 years). Chi-square test was performed to assess the statistically significant differences in proportions. The data were analyzed using Statistical Package for the Social Sciences software (SPSS V.22, Chicago, USA). In total, 1483 persons completed the survey. Table 1 shows the descriptive distribution of their demographics.

Table 1. Sample Demographics

Category	Percentage
Gender	
Male	23.3%
Female	87.7%
Age (years old)	
10-29	50.2%
30-49	41.3%
50-69	8.5%
70 or more	0%
Education Level	
Primary	1.8%
Intermediate	3.6%
High school	16.8%
Bachelor	72.4%
Postgraduate studies	5.3%
Nationality	
Saudi	85.6%
Non-Saudi	14.4%
Monthly income (Saudi Riyal)	
<5000	16.5%
5000-10000	34.7%
>10000	48.8%

The survey was concerned with participants' behavior regarding handling drug products including insulin syringes, antibiotics and cough syrups.

As shown in Table 2, after opening the needle packet, the vast majority store insulin in the refrigerator (84.4%) with lesser extent storing it in freezer or at room temperature. Statistical significance difference has been also noticed upon comparing the response groups in terms of the distribution of age ($p<0.001$). When asked about noticing the expiration dates on drug products, 87.5% said they checked it, and 12.5% reported they do not care ($p<0.001$). A statistical significant different has been detected upon adding age distribution as a co-variable ($p<0.001$), as well. On the other hand, no significant difference has been statistically detected on comparing the response groups regarding continuing usage of insulin syringes upon sun exposure in terms of input variables distribution like age, income, nationality or education level. While 96.7% reported that they do not use it, 3.3 % responded they may continue to use it ($p>0.001$). Apart from that, there was no significant statistical difference shown between groups' responses when they were asked if they could use any of their medicine after changing of color or formation. Nearly all of them (99.7%) of them declared that they would not use it with no significant difference between groups of age ($p=0.378$). In a much more specific question regarding this point, more than half (65.5%) of the participants reported that they would shake the bottle and continue using the product upon settlement at the bottom, while 0.8% and 33.6% may add some water or avoid using it, respectively, with significant statistical difference with the age distribution factor ($p=0.006$).

As shown in Table 2, there was a statistically significant difference with regards to commitment to the duration of therapy as instructed by pharmacists or physicians where 49.7% of participants reported they would always follow the instructions, 45.85% said they would follow it sometimes, and a minor group 4.5% responded that they would never follow instructions regarding the duration of drug usage ($p<0.001$). Moreover, there was significant statistical difference between the three response groups in terms of age distribution ($p=0.008$).

When participants were asked about antibiotic home storage; 69.5% said they kept it in the refrigerator and 30.5% kept it at the room temperature ($p<0.001$). No significant statistical difference different was recorded when the response has been distributed to different age groups. If the antibiotic drug had been forgotten at room temperature after dissolution by water for the whole day, 53.8% said that they cannot use it and 46.2% may use it after shaking well ($p=0.003$). In terms of age distribution, a significant difference has been statistically seen ($p<0.001$).

When asked about their behavior regarding usage of drug syrups, 58.3% of survey participants said that they keep solution dosage form like cough syrup in the refrigerator after opening and 41.7% at room temperature. Moreover, if the cough syrup was forgotten in the car, the majority (84.4%) would avoid using it. Significant statistical difference was found between responses to both questions ($p<0.001$). In crosstabs comparing these responses versus the age distribution, there was a statistical significant difference when surveying the participants about cough syrup storage ($p<0.001$) but the analysis failed to find the same outcome between the responses to leaving their medication in the car ($p=0.554$).

Table 2. Participants' behavior concerning handling drug products

Participants' behavior concerning handling drug products	Percentage
Where do you reserve insulin needles after opening it?	
In the refrigerator	84.4%
At room temperature	4.6%
In freezer	11.1%
Do you look at the expiration date before using it?	
Yes	87.5%
No	12.5%
Do you use insulin needles if exposed to sun?	
Yes	3.3%
No	96.7%
What do you do if color or form of medicine has changed?	
I get rid of it immediately	99.7%
I continue to use it	0.3%
Where do you reserve cough syrup after you open it?	
In the refrigerator	58.3%
At room temperature	41.7%
If there is drug deposition at the bottom of the bottle, what do you do?	
Shake the bottle and continue using it	65.5%
Add some water	0.9%
Avoid using it, then buying a new one	33.6%
If you forgot cough syrup in the car a whole day, what do you do?	
Avoid using it	84.4%
Continue using it	15.6%
Where do you reserve antibiotics?	
In the refrigerator	69.5%
At room temperature	30.5%
If you forget an antibiotic at room temperature after dissolution for a whole day	
I discard it	53.8%
I continue to use it	46.2%
Are you committed to the duration of usage of prescribed treatment?	
Yes	49.7%
Sometimes	45.8%
No	4.5%

Discussion

Findings emerged from the present survey is of high importance to both the health care sector and the community since it reveals the degree of public awareness towards in-home drug storage in a multiethnic country like Saudi Arabia. Availability of such in-home stored drugs is a direct risk factor to inappropriate drug using behavior like self-medication, continue using of stored drugs upon need, drug exchange among families and poor adherence and compliance [10]. It is down to the fact of the ease of access to stored drugs when needed[10]. A good example of this would be the results of the study performed in Sudan from March-May, 2002 where about 97.7% of the participants had at least one drug product stored at home [9]. The study showed a high level of inappropriate behavior of medication use like self-medication (46.9%), repeated use of leftover drugs (55.0%), drug exchange among families (59.3%) and poor compliance (71.2%) [9].

In light of this findings, there was a great need to improve public awareness toward the storage of drugs and its bad consequences if stored and used improperly [9]. On the other hand, our study revealed that there is much more awareness toward the home drug storage in Saudi Arabia (77.66% average of all positive responses regarding drug storage conditions) in relation to what recorded in Sudanese study.

Another study was done in April 2010 in Basra, Iraq to estimate self-medication and home drug storage of antimicrobials [3]. Of 300 household units participated in this study, the majority (94%) stored drugs at home. Antibiotics hit the top of stored drug list with a share percent of (26%) [3]. The most common uses were for treatment of influenza, upper respiratory tract infections, diarrhea and tonsillitis [3]. Only 42% of the total stored drugs were received appropriate storage conditions which were predefined to be in the refrigerator. In comparison, most of the participants (96.6%) in our study used to keep the antibiotic in the refrigerator and less in room temperature, even 53.8% of participants avoid using antibiotics if they forget it at the room temperature after dissolution for the whole day. Compared to our findings where 87.5% said they check the expiry date of their medication before using it, 55% of participants, in a survey conducted across the Northern United Arab Emirates, check their home pharmacy units for expired medicines [2]. It was noticed that 77.66% of our participants kept drugs at home which is less than what were reported in other studies; 97.7% in the Sudanese study, 94% in the Iraqi study and 100% in a Qatari study. Only northern Uganda showed less percent (35%) [1,3,8,9].

Of note, all above-mentioned studies surveyed participants to name drugs they store at home where the most common drugs stored at home in all studies were antibiotics, analgesics, antispasmodics, cough drugs, antipyretic drugs, and insulin [1-3,8]. However, our study mainly focused on the storage of the most photo-labile and heat sensitive medications like insulin and antibiotics. The majority of our participants store insulin syringes after opening and antibiotic in their refrigerator in proper conditions with the percentage of 84.4% and 96.6%, respectively. They usually check expiration before insulin uses, avoid using it if exposed to sunlight and discard insulin or even any drug in case of change in color or formation. When they asked about soluble dosage forms like cough preparations, about 60% of them kept it in the refrigerator, 40% at room temperature. Most of them said that they will shake the bottle if it deposits in the bottom of the bottle, some others avoid using it and few add water. Most of them said that they will avoid using of cough preparations if they forgot it in the car for a whole day and little will continue to use it.

In accordance with other studies, it is not surprising that most of the respondents were female given that responses were often filled in and received at a time of the day or office hours of their male partners [1,3,8,9]. There was a potential for selection and analysis bias in this study since there were significant differences between participants' demographics of age distribution, income, education level and nationality of respondents. That is to say, the electronic form in which the questionnaire was prepared and distributed made it difficult for the portion of population who do not have electronic device especially elderly people, to come across it. Moreover, this almost half of participants were rich (about 49 % had income more than 10 thousand SAR Saudi Arabian Riyal = 2666.31 USD). This fact positively affects all survey responses.

To our knowledge, this is the first study in Saudi Arabia of the survey format that has ever been conducted to provide insight into the awareness of Saudi Arabia residents toward home medication storage behavior. Mentioning that the sample size was relatively high compared with other studies from neighbor countries, 300 participants in Basra, Iraq, 265 in Qatar, 300 in the Northern United Arab Emirates, 469 in the Sudanese study and 892 in Northern Uganda[1-3,8,9].

Conclusion

In conclusion, nearly above three fourth of the participants (77.66%) keep their medicines at home and most of them being aware of the storage and use precautions. However, pharmacists and all healthcare professional still need to educate the public the effect of drug storage conditions on the stability and efficacy of their medications to promote their awareness toward the proper use of drugs. Finally, more controlled studies should be conducted and directed towards poor and less educated people in Saudi Arabia

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