Drug Consumers Behaviors toward the Disposal of Unused and Expired Medicines in Qassim Province/ Saudi Arabia

ABSTRACT

Background: The healthcare practitioners prescribe and dispense different medications due to increase in the prevalence of disease and this leads to the availability of unused medications, which is mostly due to a change of medication by doctors, side effect of medicines, or patient noncompliance. This study aimed to evaluate consumer’s knowledge about disposal of unused medications, and to find the reasons for possessing unused medication and its type.

Method: This is an observational cross-sectional survey conducted in Qassim province, Saudi Arabia, between 1st March and 1st April 2017, using a pretested questionnaire. Data were analyzed using Statistical Package for Social Science (SPSS) version 21.0, descriptive statistics (descriptive, cross-tab, and chi-square) was used.

Results: In the current study, the respondents were 302 of which 39.7% between age 18 and 25 years and over half of them are postgraduate. The majority of respondents (92.4%) reported that they had not used (18.5%) of all purchased medicines due to expired medications. The majority of respondents (85.8%) reported that they do not know the proper way to dispose of unused and expired medicine. The most common method of disposal of unused medicines was to keep it at home until expired (57.72%) or flush them down the toilet (28.52%) while some respondents (5.03%) state that they gave them to a friend. On the other hand, more than two-third of respondents disposed expired medications by throwing them away in household (75.75%).

Conclusion: The majority of respondents in this study confirmed to practice irrational method of drug disposal. Reasons may be linked to the low awareness level of respondents, as well as the lack of systems instructing the recollection of unwanted household medications.

KEYWORDS: expired medicines, disposal, unused medicine, irrational disposal

INTRODUCTION

The prevalence of disease emerges the increase in prescribing and dispensing different medications, this lead to availability of unused medications which is mostly due to a change of medication by the doctor, side effect, or patient noncompliance. The common attitude to dispose unused medications by flushing them down a toilet, rinsing them down a sink, or throwing them in the trash may be hazardous. Flushing medicines down to the toilet or sink is undesirable since it may lead to water pollution, in spite of that the concentration of these medications is not significant; but, long-term exposure could be fatal.

Environmental contamination is one of the major alarming issues regarding the inappropriate disposal of medications. In the past, more than 100 different medications found in the environment, were detected in wastewater. In addition, the antibiotics found in the environment may lead to antibiotic resistance.

On the other hand, medications disposed in the trash can lead to accidental poisoning and misuse of medications in case of controlled substances. The most of the children who are subject to accidental poisoning by the...
treatment gain access to the medication at home\textsuperscript{10}. The Food and Drug Administration has reported several deaths due to inadvertent exposure to fentanyl patches\textsuperscript{11}.

Several countries have developed policies for the disposal of unused and expired medications e.g., in the United States, they developed federal guidelines for the disposal of drugs\textsuperscript{12}, in the United Kingdom, particular pharmacies accept unwanted medications from patients on behalf of the National Health Service or waste contractors. Moreover, they prepare guidelines for pharmacies concerning the correct disposal of medications\textsuperscript{13}, in Australia, the government established the National Return and Disposal of Unwanted Medicines program since 1998 to ease the safe disposal of medications in the community\textsuperscript{14}, some states in Mexico have implemented programs for the collection of unwanted medications from households\textsuperscript{15}.

The number of studies conducted regarding medication disposal practices in the Middle East is limited, mainly in Saudi Arabia\textsuperscript{16}. Saudi Arabia does not have guidelines regarding disposal of unused and expired medications.

This study aimed to evaluate consumer’s knowledge about disposal of unused medications, and to find the reasons for possessing unused medication and its type.

**METHODS**

**Study design**

This is a descriptive, cross-sectional survey, which was conducted pre-validated structured questionnaire. The study was conducted in Qassim Province between (1\textsuperscript{st} March and 1\textsuperscript{st} April 2017).

**Study population**

The study population included students, public and private sector employees, and population from other walks of life, above the age of 18 years.

**Samples size**

The sample size was 302 consumers from Qassim province.

**Study instrument**

The questionnaire consisted of two sections:

Section I: Included demographic characteristics of respondents.

Section II: Included classes of unused or expired medications and attitudes concerning disposal of unused and expired medications.

**Data collection method**

Participation in the survey was voluntary. The purpose of the study was explained to respondents prior to administering the questionnaire to make it more comprehensible.

**Data analysis**

Data were analyzed using Statistical Package for Social Science (SPSS) version 21.0 for analysis. Descriptive statistics (descriptive, cross-tab, and chi-square) were used.

**Exclusion criteria**

1. Respondents less than 18 years old.
2. Those who do not have any stored medicines in their houses.

**RESULTS**

**Demographic data for survey responders**

Among the 302 respondents who completed the questionnaires, 55% were female and 45% were male. The majority of respondents (40%) were between 18 and 25 years. Regarding educational level, 57% were postgraduate and only 2% of the respondents were illiterate. (Table 1)

**Availability of unused and expired medications, and its impact on the environment**

The majority of the respondents (92%) reported that they had unused medications, 18.5% had expired medications, and 37% of them did not know. On the other hand, 86% of the respondents did not know the proper way for disposal of unused and expired medicines.


<table>
<thead>
<tr>
<th>Table 1</th>
<th>Demographic data for survey responders, N = 302.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable</strong></td>
<td><strong>Number (%)</strong></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>136 (45.0)</td>
</tr>
<tr>
<td>Female</td>
<td>166 (55.0)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>18–25</td>
<td>120 (39.7)</td>
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<tr>
<td>26–33</td>
<td>63 (20.9)</td>
</tr>
<tr>
<td>34–41</td>
<td>72 (23.8)</td>
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<tr>
<td>42 and above</td>
<td>47 (15.6)</td>
</tr>
<tr>
<td><strong>Level of education</strong></td>
<td></td>
</tr>
<tr>
<td>Illiterate</td>
<td>5 (1.7)</td>
</tr>
<tr>
<td>Primary school</td>
<td>24 (7.9)</td>
</tr>
<tr>
<td>Intermediate school</td>
<td>21 (7.0)</td>
</tr>
<tr>
<td>High school</td>
<td>79 (26.2)</td>
</tr>
<tr>
<td>University</td>
<td>173 (57.3)</td>
</tr>
</tbody>
</table>
Regarding respondents’ knowledge about the impact of improper disposal of medication, more than half (67%) of respondents believed that improper disposal of unused and expired medicines can affect the environment and health, while 23% of them did not know. (Table 2)

### Reasons for possessing unused medications

The stoppage of treatment on symptomatic relief was the main cause of possessing unused medications (61.64%), while frequent changes of prescription by physicians represent (14.38%), other reasons, such as noncompliance to treatment and prescription of drugs represent 11.99% for each (Fig. 1).

### Types of unused medications

The most common types of medications being unused included analgesics (50.50%), antibiotics (32.50%), and vitamins (6.00%) as shown in Fig. 2.

### Methods of disposal of unused and expired medications

The majority of consumers kept unused medications at home till it expired (57.72%) or flush them down to the toilet (28.52%), while some consumers (8.72%) giving them to a friend, and only 5% of consumers returned them to a pharmacy as shown in Fig. 3. On the other hand, 75.75% of the respondents state that they dispose expired medications by throwing them away in household, 8.97% throw them in the toilet, and minor percentage of consumers returned them to medical store (4.98%) as shown in Fig. 4.

### The possession of unused medication in comparison with age and level of education

About 92.4% of the respondents keeping unused medication at home, majority of them (38.4%) between the age of 18 and 25 years, in addition to that 54.6% from university level possess unused medicines, and minor percentage of them did not have any medicine at home (7.6%). (Table 3)

### Type of unused medications in comparison with gender, age and level of education

The most common unused medications in comparison with gender, age, and level of education were analgesics (50.5%), followed by antibiotics (32.5%), and the least unused medications were vitamins. (Table 4)

### Reasons of stocking unused medication in comparison with gender, age and level of education

All the respondents (gender, age groups, and levels of education) reported that the cause of keeping unused medications was due to discontinuity of treatment on

| Table 2 Availability of unused and expired medications, and its impact on the environment. |
| Variable                                                                 | Yes (No,%) | No (No,%) | I Don’t know (No,%) |
| Did any quantity of purchased medicine remain unused at your home?         | 279 (92.4) | 23 (7.6)  | –                  |
| Do you have any expired medications in your home?                          | 56 (18.5)  | 134 (44.4) | 112 (37.1)         |
| Do you know the proper way to disposal of unused and expired medicines?   | 43 (14.2)  | 259 (85.8) | –                  |
| Do you think that improper disposal of unused and expired medicines can affect the environment and health? | 203 (67.2) | 30 (9.9)  | 69 (22.8)          |

Fig. 1 Reasons for possessing unused medication.  
Fig. 2 Type of unused medications.
Drug consumers behaviors toward the disposal of unused and expired medicines

symptomatic relief, unfortunately, those who were at university level represent 34.6% out of 61.6%, followed by frequent change of prescriptions by physicians (14.4%). (Table 5)

Respondents opinion regarding the responsibility of public education on safe disposal of unused medications

More than two-third of consumers (84.75%) state that ministry of health is responsible for public education on proper disposal of unused medication, 11.70% thought that it was the responsibility of Saudi Food and Drug Authority, and 3.55% mention the municipality. (Fig. 5).

DISCUSSION

Disposal of unused medicines has been a rising concern due to security and environmental reasons. The proper collection and disposal of unused medications through a well-run disposal system and collection programs are vital in ensuring safety of humans and the environment. A total of 302 respondents were successfully
responded to this study. The current study had shown that 39.7% of respondents between the age of 18 and 25 years and over half of them are postgraduate.

The majority of the respondents (92.4%) reported that they had unused of purchase medicine. Only (18.5%) of them had expired medications. Unwanted or expired medications in the home pose a serious health and safety risk, especially to children and pets, as these groups are at highest risk of accidental medication exposure and toxicity. In the US, approximately 165 children are seen in emergency departments daily because of accidental medication ingestion\textsuperscript{19,20}. The results showed that almost respondents claimed to experience disposing of unwanted medicines. Over half (67.2%) of the respondents believed that discarded medicines may impact the environment negatively, but the majority of the respondents (85.8%) reported that they do not know the proper way to disposal of unused and expired medicines.

In the present study, the most common method of disposal of unused medicines was to keep at home till it expired (57.72%) or flush them down to the toilet (28.52%) while some respondents (5.03%) state that they gave them to a friend. On the other hand, more than two-third of respondents disposed expired medications by throwing them away in household (75.75%), 8.97% of respondents flushed them in a toilet, and 4.98% of the respondents returned them to medical store.

These results were comparable to those obtained by researchers in the United States where 54% threw unwanted medication in the trash, 35% flushed them down to the toilet or sink and 1% returned them to a pharmacy, also a Canadian telephonic survey revealed that 46% used drainage systems, 31% threw in a trash and 17% returned unused medicines to the pharmacy\textsuperscript{21}.

In a study conducted at Washington, more than half of the patients stored unused and expired medications in their homes, of those, more than half flushed them down to the toilet, and 22.9% returned medication to a pharmacy for disposal.

In our study, the most common types of medications being unused are analgesics (50.5%); antibiotics (32.5%) and vitamins (6%). Over the counter medications were the most common medicine stored in respondents’ households, this is a major concern. Regarding reasons for keeping unused medicines for the majority of respondents (61.6), reported that stoppage of treatment on symptomatic relief was the main cause, while frequent change of prescription by physicians represent 14.4%. Other reasons, such as noncompliance to treatment and prescription of drugs are more than required represent approximately the same percentage of respondents 11.9%.

### Table 5

<table>
<thead>
<tr>
<th></th>
<th>Frequent change of prescriptions by physicians %</th>
<th>Prescription of drugs more than required %</th>
<th>Discontinuity of treatment on symptomatic relief %</th>
<th>Noncompliance to treatment %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>5.1</td>
<td>3.8</td>
<td>27.4</td>
<td>7.5</td>
</tr>
<tr>
<td>Female</td>
<td>9.2</td>
<td>8.2</td>
<td>34.2</td>
<td>4.5</td>
</tr>
<tr>
<td>Total</td>
<td>14.4</td>
<td>12.0</td>
<td>61.6</td>
<td>12.0</td>
</tr>
<tr>
<td>Age</td>
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<tr>
<td>18–25</td>
<td>6.5</td>
<td>5.1</td>
<td>21.6</td>
<td>6.5</td>
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<td>26–33</td>
<td>3.4</td>
<td>3.4</td>
<td>12.3</td>
<td>2.1</td>
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<td>34–41</td>
<td>2.4</td>
<td>2.4</td>
<td>16.1</td>
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<td>42 and above</td>
<td>2.1</td>
<td>1.0</td>
<td>11.6</td>
<td>0.7</td>
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<tr>
<td>Total</td>
<td>14.4</td>
<td>12.0</td>
<td>61.6</td>
<td>12.0</td>
</tr>
<tr>
<td>Level of education</td>
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<tr>
<td>Illiterate</td>
<td>0.7</td>
<td>0.0</td>
<td>1.0</td>
<td>0.0</td>
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<tr>
<td>Primary school</td>
<td>0.3</td>
<td>1.7</td>
<td>6.2</td>
<td>0.0</td>
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<tr>
<td>Intermediate school</td>
<td></td>
<td>0.0</td>
<td>5.1</td>
<td>1.4</td>
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<tr>
<td>High school</td>
<td>4.5</td>
<td>2.1</td>
<td>14.7</td>
<td>5.8</td>
</tr>
<tr>
<td>University</td>
<td>8.6</td>
<td>8.2</td>
<td>34.6</td>
<td>4.8</td>
</tr>
<tr>
<td>Total</td>
<td>14.4</td>
<td>12.0</td>
<td>61.6</td>
<td>12.0</td>
</tr>
</tbody>
</table>
In Chicago, 37% of respondents reported having leftover unexpired medications from a previous illness; the main causes are due to taking medication as needed or because the respondent felt better. In another similar study conducted in New Zealand, 62% of respondents had unwanted medications in their home. The most common reason for people to have leftover medication was “medical condition improved or resolved.”

Concerning the responsibility of public education on proper disposal of unused medications, more than two-third of consumers (84.75%) states that ministry of health is the responsible body.

**CONCLUSION**

The majority of respondents in this study confirmed to practice irrational method of drug disposal. Reasons may be linked to the low awareness level of respondents, as well as the lack of systems instructing the recollection of unwanted household medicines. Hence, introducing such drug-disposal systems would improve the outcomes.

**REFERENCES**