KNOWLEDGE, ATTITUDE AND PRACTICE OF MEDICAL PROFESSIONALS TOWARDS THE SAFE DISPOSAL OF UNUSED MEDICATIONS IN SOUTH INDIA

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ABSTRACT

Environmental contamination of medications is a serious threat that has attained attention in recent years. The most environmentally unfriendly means of disposition of leftover medication are reported to be disposition of drugs into the sink, toilet, or into the dust bin. With this background, the present study was conducted to assess the Knowledge, Attitude, and Practice (KAP) of medical professionals towards the safe disposal of medication. Twenty-eight percent of the participants were aware of the fact that medications excreted by human appear in sewage system and are detectable in the ecosystem. All the participants agreed that the government should make strict policies regarding the drug disposal and 77% agreed that pharmaceutical companies should take back the expired drugs. Also, 65% respondents agreed that they dispose unused medication in the garbage, and 9% disposes unused medication in the toilet or sink. There is a strong requirement for increasing awareness about safe disposition of medications.

KEYWORDS: Ecopharmacovigilance, disposal of medication, ecosystem.

INTRODUCTION

With the increased use of medicines both in human and veterinary practice, the extent of environmental contamination is also high. The potential routes of entry of medications into the environment are through patient excretion into the sewage system, direct release through...
sewage from manufacturing units, or disposal of unused medication via trash or flushing.\[^2\] Few outcomes of such environmental contamination are a decline in number of vultures, sterility in frogs, and feminization of male fishes.\[^3,4\] Few studies have reported the alarming decline in sperm count in men over the last few years and antibiotic resistance due to environmental exposure of medications.\[^5\]

This is a serious threat worldwide and has opened a new branch of science called Ecopharmacovigilance (EPV). EPV is concerned with detection, assessment, understanding, and prevention of adverse effects related to the presence of pharmaceuticals in the environment, which affect human and other animal species.\[^6\] The approaches of EPV include green drug design, green chemistry in process development, development of biodegradable products, minimization of manufacturing emissions, education over rational use of drugs, improved prescribing practices, and safe disposal of unused drugs.\[^7,8\]

Medication disposal habits are influenced by environmental awareness, availability of guidelines, dosage form, and social and cultural attitudes. The most environmental unfriendly means of drug disposition are disposing drugs into the sink, toilet, or into the dust bin. In India, the major reason for possession of unused, expired medicines is reported to be due to purchase of over the counter (OTC) drugs for self-medication.\[^9\] With this background, the present study was conducted to assess the Knowledge, Attitude, and Practice (KAP) of medical professionals towards the safe disposal of medication.

**MATERIALS AND METHODS**

**Place of the study:** The present study was carried out at Vydehi Institute of Medical Sciences and Research Centre, Bangalore.

**Study duration and permission:** The study was conducted in the month of December’ 2013. It was approved by the Institutional Ethics Committee.

**Design of the questionnaire:** The questionnaire consisted of the demographic data, questions on the type of unused/expired medications at home, reasons for stockpiling of leftover medications, disposal techniques adopted to dispose solid, liquid and semi-solid medications and questions exploring KAP about safe drug disposal methods. There were 5 questions about knowledge, 5 on attitude (Likert scale), and 8 about the practice of disposition of unused medications.
Collection of responses: A structured validated questionnaire was prepared to assess the KAP of medical professionals about the disposition of leftover medications. The purpose of the study was explained to the participants and their confidentiality was ensured. Informed consent was obtained from them before filling the questionnaire.

Data analysis: The data collected was analyzed using descriptive statistics.

RESULTS

Response rate: A total of 200 questionnaires were distributed. Out of them, 163 were returned giving a response rate of 81.5%.

Demographic details: The mean age of the participants was 27.98 years. Fifty-six percent of the participants were males, and 44% females. 23.53% participants gave history of chronic diseases in the family. The most common chronic diseases cited were diabetes mellitus (17.6%), hypertension (12.5%), and others (69.9%). One participant gave family history of myasthenia gravis and psychosis. The medication that are usually kept at home were found to be paracetamol, cough syrups, anti-diabetics, anti-hypertensives, aspirin, anti-histamines etc. The list of medications is shown in Table 1.

Table 1: List of medications used and found to be stocked at home

<table>
<thead>
<tr>
<th>Classification</th>
<th>Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-diabetic drugs</td>
<td>Metformin, Insulin, Vildagliptin</td>
</tr>
<tr>
<td>Anti-hypertensives</td>
<td>Losartan, Amlodipine, Telmisartan</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>Amoxycillin and cloxacillin, Amoxicillin and clavulinic acid, Ciprofloxacin, Erythromycin</td>
</tr>
<tr>
<td>Antipeptic ulcer drugs</td>
<td>Aluminium hydroxide, Digene, Ranitidine</td>
</tr>
<tr>
<td>CNS drugs</td>
<td>Olanzepine, Fluoxetine</td>
</tr>
<tr>
<td>Respiratory drugs</td>
<td>Ambroxol</td>
</tr>
<tr>
<td>Non-steroidal anti-inflammatory drugs</td>
<td>Aspirin, ibuprofen, paracetamol</td>
</tr>
<tr>
<td>Hypolipedemics</td>
<td>Atorvastatin</td>
</tr>
</tbody>
</table>

The KAP responses are enumerated as follows

Knowledge of medication disposal: 28% participants were knowledgeable of the fact that medications excreted by human appear in sewage system and are detectable in the ecosystem. And none of the participants could name the drug, fentanyl, that can be flushed through the toilet. 43% participants were aware of the fact that unused medication should be disposed after mixing with coffee grounds. Sixteen percent respondents opined that the presence of pharmaceuticals in the environment can cause feminization of male fish. Only 5% of the
participants were aware about the correct method of disposal of insulin syringes. The results are shown in Figure 1.

![Figure 1: Knowledge score (n=163)](image)

**Attitude of medication disposal:** All the participants agreed that the government should make strict policies regarding the drug disposal. Seventy-seven percent, 9%, and 12% participants agreed, disagreed or were not sure about whether pharmaceutical companies should take back the expired medications. Eighty-five percent participants agreed that purchasing medicines without prescription can add to the load of unused medicines at home. Thirty-nine percent respondents mentioned that the pharmacy 'medication take back program' can mean more work for pharmacies and is not possible in India, 26% opined that it is possible and the remaining 35%; were not sure about that. Ninety-one percent respondents agreed that proper education and guidance is strongly recommended for the safe drug disposal of unused medications. The results are shown in Figure 2.

![Figure 2: Attitude of disposition of left over medication (n=163)](image)
Practice of medication disposal: Sixty-two percent participants mentioned that they use all the prescribed medications. Sixty-two percent mentioned that they dispose unused medication, 65% agreed that they dispose unused medication in the garbage, and 9% disposes unused medication in the toilet or sink. When asked about whether unused medications are used for another family member without prescription, only 20% respondents responded positively. Sixty-two percent participants return unused medication to the pharmacy, and 83% of them empties liquid medications in the sink and gives the glass bottle for recycling. The results are shown in Figure 3.

![Figure 3: Practice of disposition of left over medication (n=163)](image)

DISCUSSION
The global increase in the use of pharmaceuticals has lead to an increased international awareness of the potential detrimental effects on the environment. Other than US Food and Drugs Administration, many other countries have come up with guidelines on the proper disposal of medication.\[^{10, 11}\] In India, the national formulary published in 2011, provides guidelines on the same. Previous studies conducted in India and abroad mention that the knowledge about environmental implications of unsafe medication disposal was inadequate.\[^{12}\]

In this study, the mean age of the participants was 27.98 years. Fifty-six percent of the participants were males, and 44%; females. 23.53% participants gave history of chronic diseases in the family. The most common chronic diseases were diabetes mellitus (17.6%), hypertension (12.5%), and asthma (0.12%). These findings are in accordance to a previous study that stated that diabetes and hypertension are the most common chronic diseases in
The medication that were found to be kept at home were paracetamol, cough syrups, anti-diabetics, anti-hypertensives, aspirin, anti-histamines etc. which are similar to the findings of a previous study conducted in dental students.\cite{10}

Regarding knowledge of ecopharmacovigilance, only 28% participants were knowledgeable of the fact that medications excreted by human appear in sewage system and are detectable in the ecosystem. In a previous study conducted in South India, only 35% participants were aware about the consequences of improper disposal of medications.\cite{15} Regarding attitude, 100% participants agreed that the government should make strict policies regarding the drug disposal. Previous studies also emphasized that in India, there is need to implement stringent take-back programs and also to impart awareness to public regarding this serious concern.\cite{10,15} Regarding practice, 65% participants agreed that they dispense unused medication in the garbage which is in accordance with previous studies.\cite{10,15,16} In this study, 62% participants agreed that they return unused medication to the pharmacy, and 83% of them empties liquid medications in the sink and gives the glass bottle for recycling. This is a good trend as a previous study had reported that only 3.2% participants mentioned of returning unused medication to the pharmacy.\cite{15}

**CONCLUSION**

The study reflects that medical professionals do not use all the medications available at their houses due to side effect, dosage changes, discontinuation of the drug, or due to expiration date. Therefore, they expire. Expired or left out medications need clear guidance about safe disposition into the environment. If medical professionals become aware and educated about safe disposal of medication, or have the right attitude regarding the same, and agree to adhere to practice guidelines, they can educate the patients and community about the same. Along with regulatory and other interested bodies, they are the key persons who should work together towards the goal to create a safe environment for future.

**REFERENCES**


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