

Pharmaceutical waste disposal in Portuguese households

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Abstract

The correct management of medicine waste generated in households is essential when pursuing environmental sustainability. Characterizing, analyzing and understanding the behavior of the citizens when it comes to the generation, storage and discarding of medicine waste is a critical first step toward developing an effective waste management strategy for these wastes. This work presents for the first time in Portugal a nation-wide study of the amounts of medicine waste generated at households, based on a waste characterization campaign carried out for nine months, between September 2014 and March 2015. The campaign targeted 300 families of different economic and social backgrounds and composition, distributed across Portugal. Approximately 30% of inquired householders mix unused medicines with unsorted waste or flush them down the toilet, indicating the need to change these negative behaviours in order to divert medicines from waste and wastewater streams.

Introduction

The correct management of medicine waste generated in households is essential. Currently, Hundreds of different active pharmaceutical compounds are discarded in the environment due to incorrect disposal of household pharmaceutical waste. This is the second major pathway into the environment. However, rigorous numbers are not available concerning the amounts of waste released by householders.

Collection and disposal of household pharmaceutical waste could represent an important measure to protect the environment, while also protecting human health from unintended exposure and inappropriate use. An effective collection scheme for human medicines would divert unused pharmaceuticals from waste streams, leaving only the pharmaceutical residues (unaltered or as

metabolites) that pass through the body to contaminate the sewage systems.

The Waste Framework Directive (Directive 2008/98/EC) establishes the basic principles and provisions on re-use, recycling, recovery and disposal of waste to avoid dangers to human health and harm to the environment. The Directive clarifies that collection schemes for medicines from household waste are not to be subject to registration, as the schemes present a low risk and contribute to the separate collection of waste. Further to that, Directive 2004/27/ EC (relating to medicinal products for human use) introduces the obligation of Member States to have “*specific precautions relating to the disposal of unused medicinal products*” as well as the obligation to implement appropriate collection systems (Article 127).

Pharmaceutical waste discarded by households in Portugal is the aim of appropriate collection schemes, through VALORMED, which is the national entity responsible for both packaging waste and unused pharmaceutical products collection and treatment, since 1999. As recent as 2014, VALORMED collected 1002 Mg of unused medicines and its packaging. From that amount 41% has been effectively recycled and the rest incinerated (Valormed 2015).

Detailed information regarding the waste potential of unused medicines and its packaging is also unknown from most European Union Member States, and their Environmental Authorities. Therefore, it's hard to estimate the efficiency of collection schemes for unused pharmaceuticals throughout Europe as no relevant data exists. Moreover, the amounts collected per Member State are also scattered, incomplete and lack coherency. Thus, preventing comparisons between countries and each type of scheme implemented. That is a major hurdle in assessing which system is best for this waste stream.

In Portugal several inquiries and surveys (verbal, *vis-à-vis*) were completed in order to understand and assess general public's awareness and habits, concerning this waste stream, especially the disposal pathway (Urban waste, pharmacies; others). This approach contributed to a better understanding of attitudes towards unwanted medicines and the efficiency of existing pharmaceutical collection schemes.

A recent survey was carried out by the Health With No Harm (HWNH) organization in the capital cities of six European countries, namely Belgium, Hungary, Italy, Lithuania, Portugal and the United Kingdom (HWNH, 2013). The survey comprised 100 interviews in each country and the results concerning attitudes towards pharmaceutical waste disposal are shown in table 1. These results suite our purpose of benchmarking our own results.

Table 1 - Pharmaceutical waste awareness survey (HWNH, 2013)

	Belgium	Hungary	Italy	Lithuania	Portugal	UK
QUESTION: Are you aware if in your country you can return unused medicines to a collection system?						
Yes	62%	63%	82%	54%	85%	38%
No	38%	37%	18%	46%	15%	62%
QUESTION: If you received further information on how to dispose correctly of unused medicines would you follow this?						
Likely / Very likely	96%	65%	91%	-	81%	85%
QUESTION: Do you agree with the following statement: Medicines disposed of incorrectly can contaminate the environment						
Agree / Strongly agree	80%	65%	80%	82%	70%	65%
QUESTION: Are there initiatives to reduce the presence of pharmaceuticals in the environment						
Agree / Strongly agree	51%	67%	58%	56%	54%	63%

Characterizing, analyzing and understanding the behavior of the citizens when it comes to the generation, storage and discarding of medicine waste is a critical first step toward developing an effective waste management strategy for these wastes. In the current work, a survey is carried out in Portugal aiming at better understanding the current habits, behaviour, attitudes, awareness and knowledge concerning pharmaceutical waste.

Material and Methods

We investigated primarily which amounts of medicines are stored at households, and how people deal with unused pharmaceutical products. The approach to get this information begun with a statistical survey on the number of households, and resident's strata (social, economic, age, gender) representing the country profile. The interviewees were spread evenly across different age groups.

Structured one-to-one interviews were conducted in the entire country, covering north and south, rural and metropolitan areas. The number of households considered was 242, englobing 635 residents, including children.

Five main sociological groups were defined, A to E, namely, **A** - Couple (or individual) aged over 65 years old; **B** - Couple (or individual) aged under 35 years old, without children; **C**- Couple (or individual) aged with children over 12 years old; **D** - Couple (or individual) aged with children over 12 years old; **E** - Couple (or individual) without children aged > 35 and under 65 years old.

Field work started late August 2014. For each area of the country, one surveyor was selected to

conduct the interviews. All interviewers participated in a training session that focused on how to perform and document the interviews.

Interviewers approached people directly on their homes. At the beginning of each interview, the interviewer explained the goal of the project. Each interviewee, and household, was given a study code and the surveyor completed the interview form. No personal data was collected.

The respondents were also asked several questions that covered demographic characteristics (age, group and sex), behaviour and opinions in relation to the disposal of unused medicines, the collection system implemented in their country and the level of awareness of the problem of pharmaceuticals in the environment. Closed and open-ended questions were used. The open-ended questions were used to try to obtain truthful answers and avoid people feeling pressed to give answers that they thought the surveyor might want to hear.

An assessment of the amounts of medicines and pharmaceutical waste kept at home was simultaneously carried out during the house visits. The medicines were classified into three groups: **A** – Medicines currently in use (either acquired over the counter or prescribed by the doctor); **B** – Medicines in stand-by modus and **C** - Discarded medicines, ready to be thrown away. The weight of each group was registered.

Results and discussion

The results showed that 83,6% of the interviewed householders have medicines in use and 88,4% have medicines stocked at home. The average weight of medicines kept at home per family and per individual is 1,086 kg and 0,414 kg, respectively, of which 7,7% represent discarded medicines ready to be thrown away, 72,5% are stocked medicine (not in use) and only 19,8% is medicine in use.

The majority of householders (66,4%) deliver their pharmaceutical waste at the local pharmacy (figure 1), following the recommendations of VALORMED, the entity responsible for the collection and management of this waste in Portugal. However, only 53% of households actually knows about the existence of this entity. Also interesting to note is that 50% of householders do not know what happens to discarded waste, when delivered at the local pharmacy. More than 59% also claimed that the reason they deliver unused medicines at the pharmacy is to protect the environment and/or to increase material recycling.



Figure 1 – Destination given to pharmaceutical waste by householders

25.6 % of householders is discarding their pharmaceutical waste in the unsorted waste container and 2.0% is going to drop containers in order to recycle pharmaceutical packaging waste. After a decade of campaigns and environmental awareness, 2.4% still flush waste pharmaceuticals down the toilets.

Conclusion

Even though the majority of the population already delivers their spent medicine at the local pharmacy, approximately 30% of inquired householders mix unused medicines with unsorted waste or flush them down the toilet, indicating the need to change these negative behaviours in order to divert medicines from waste and wastewater streams.

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